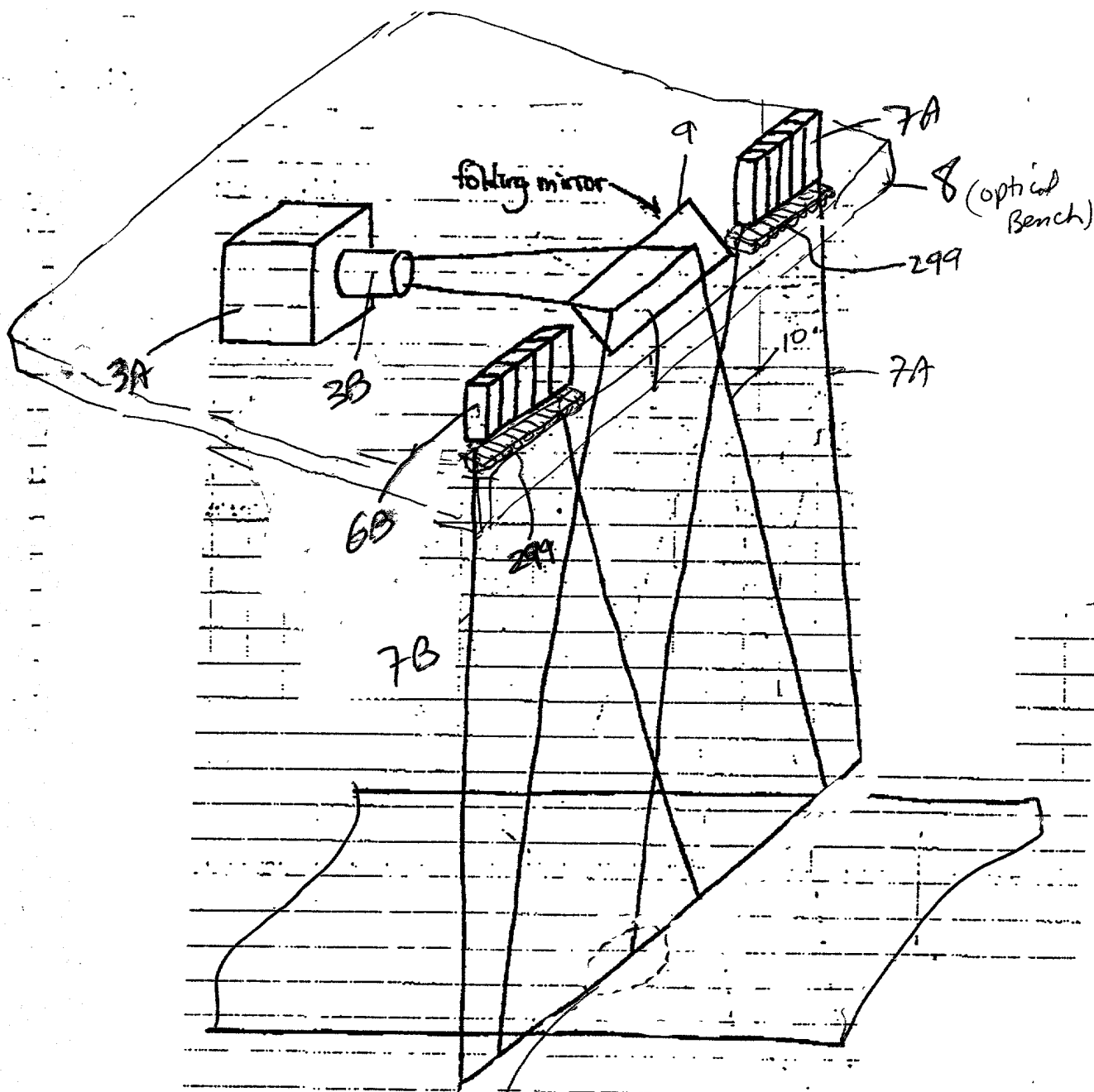




FIG 1A



↑  
1A

FIG. 1B1

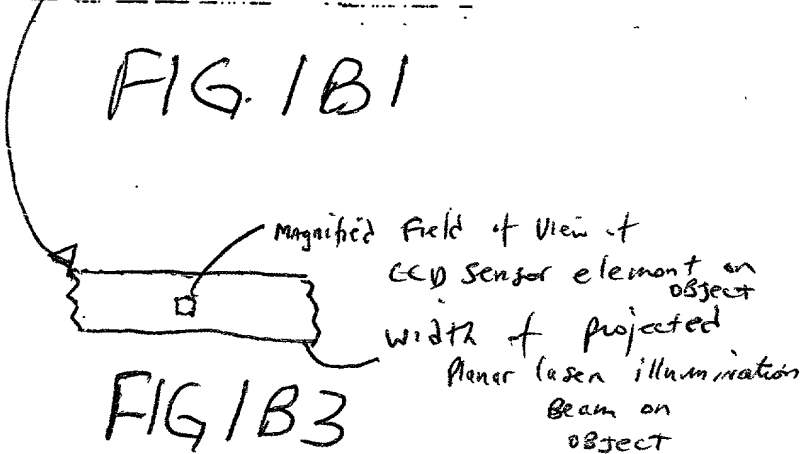


FIG. 1B3

10068803.020902

- (1) Fixed focal length camera lens
- (2) Fixed ~~fixed~~ distance

Linear (1D)  
Detector array

Module housing

$X_{FS}$

$X_{FS}$

3B

9

3/332

6A

299

7A

10

Few

4

FIG. 1B2

11A 11C 11F

6B

7B

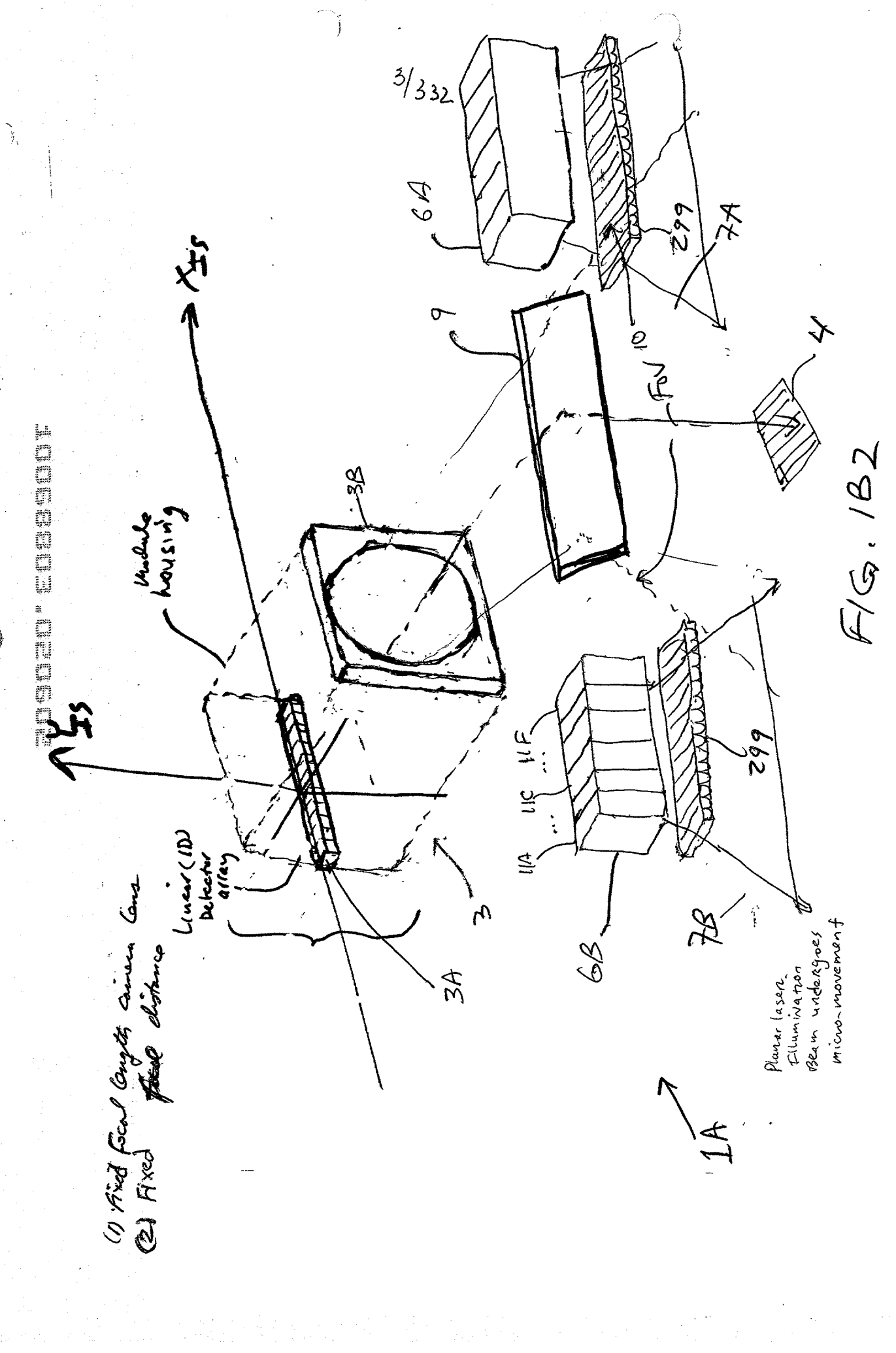
299

Planar laser  
illumination  
beam undergoes  
micro-movement

1A

3A

3



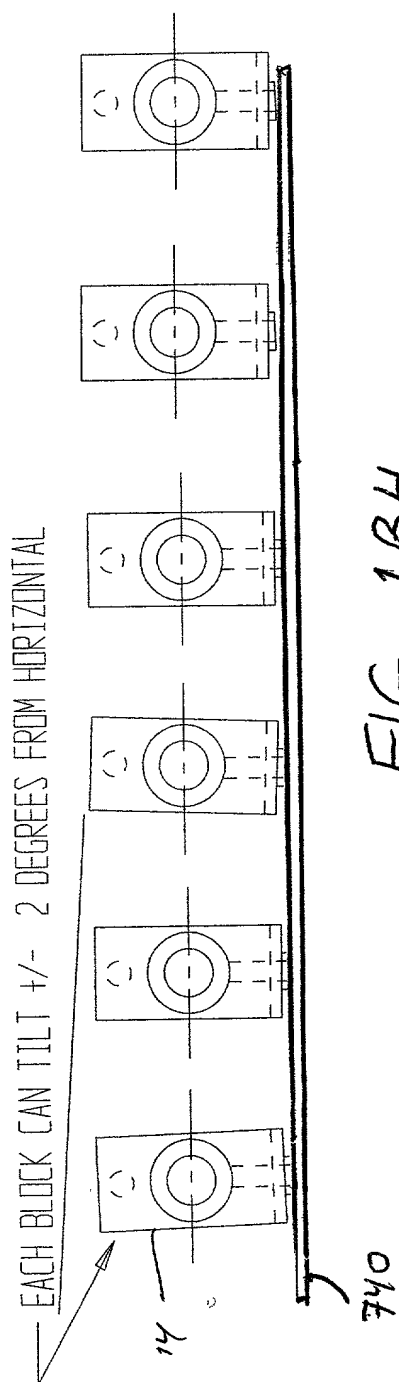


FIG. 1B4

# VLD BLOCK CAN PITCH FORWARD FOR ALIGNMENT WITH OTHER VLD BEAMS

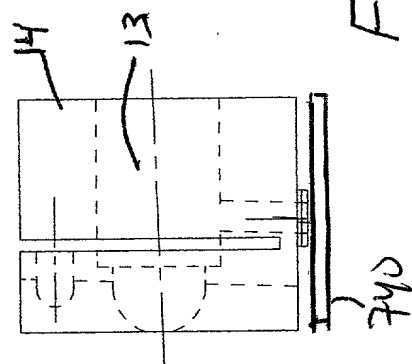


FIG. 1B5



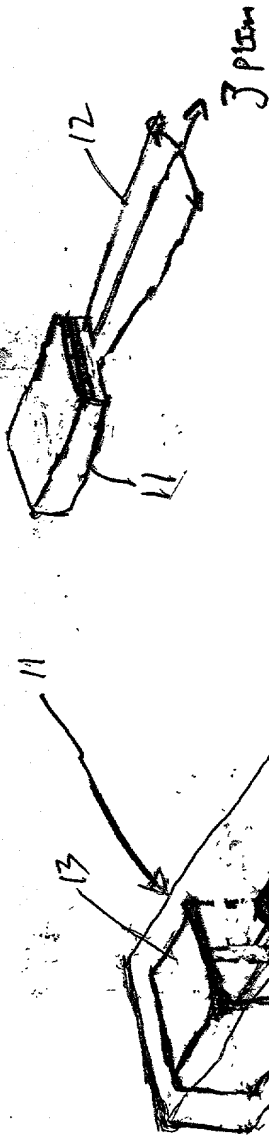


FIG. 1C

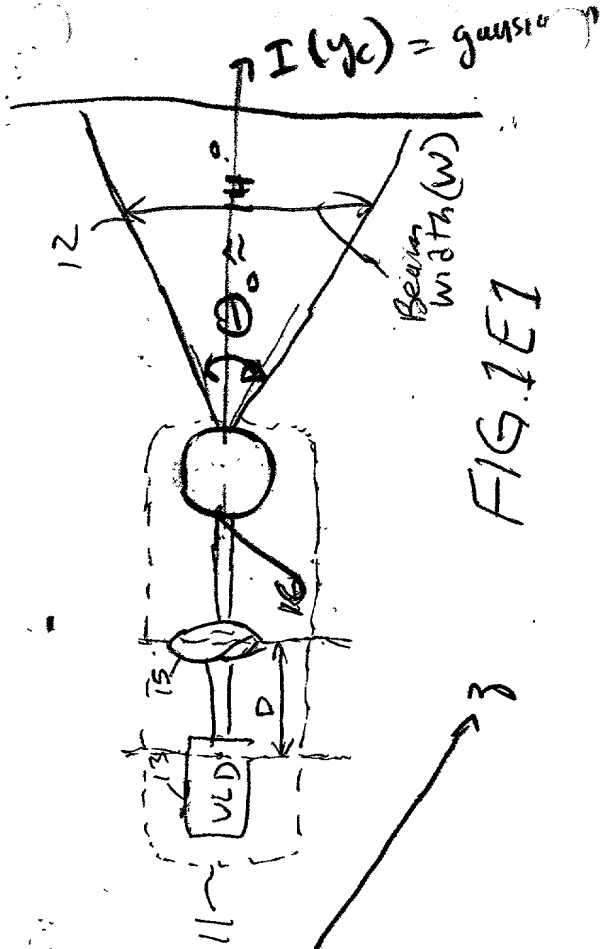


FIG. 1D

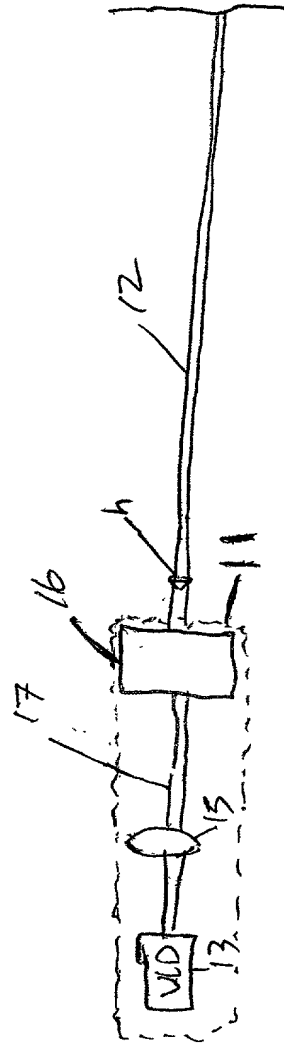


FIG. 1E2

5/332

Maximum  
object  
Range

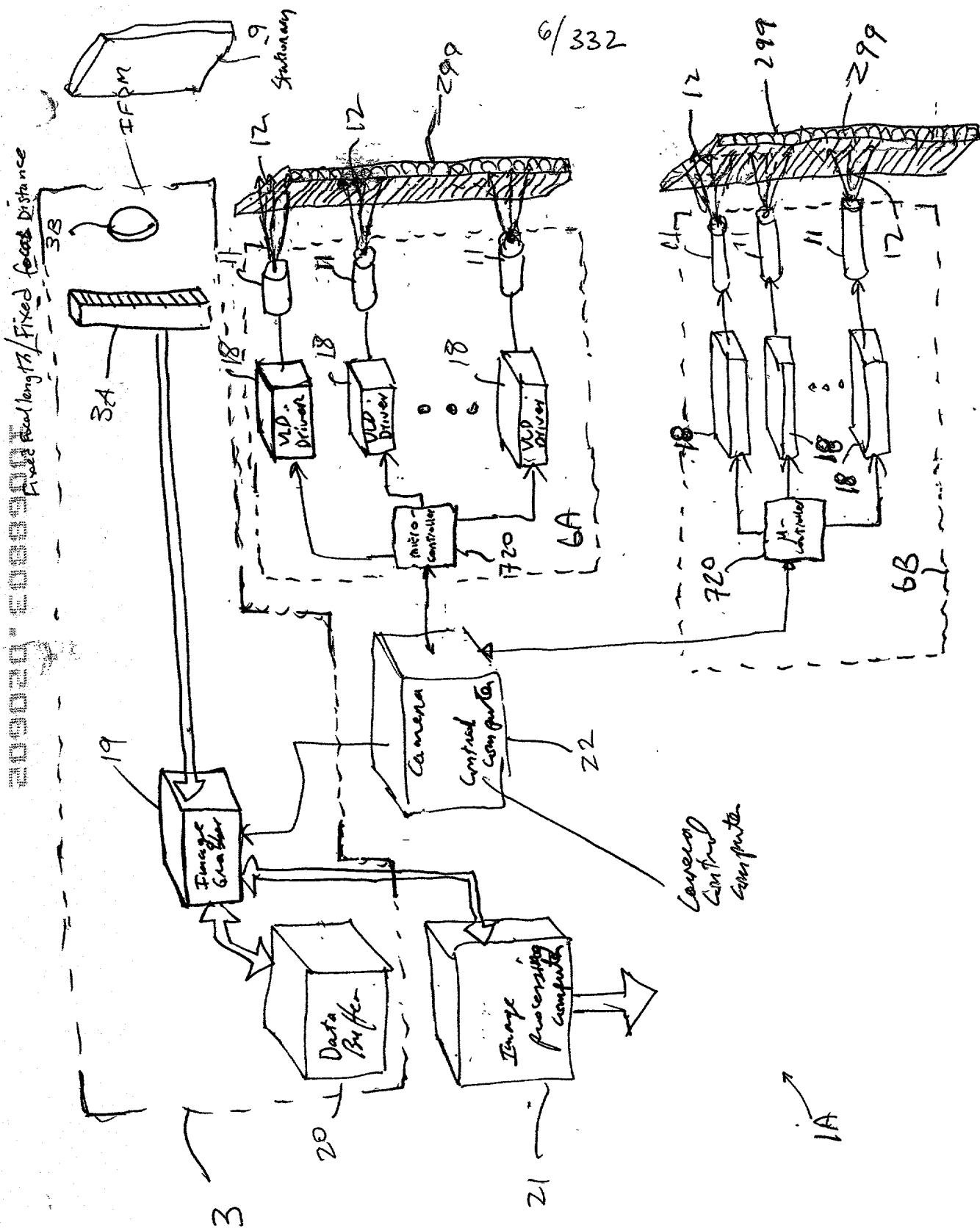


FIG. 1F



8/ 332

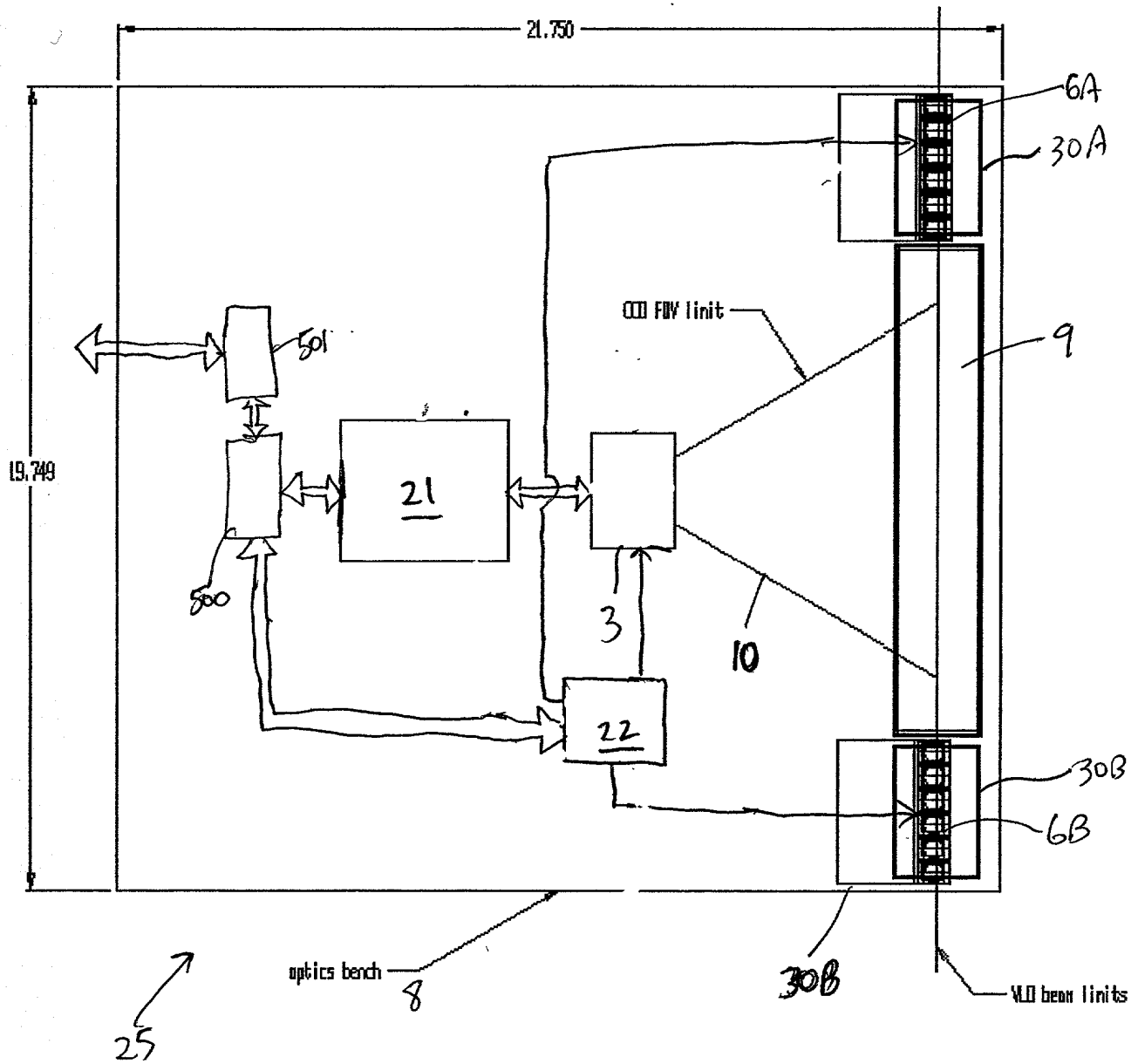
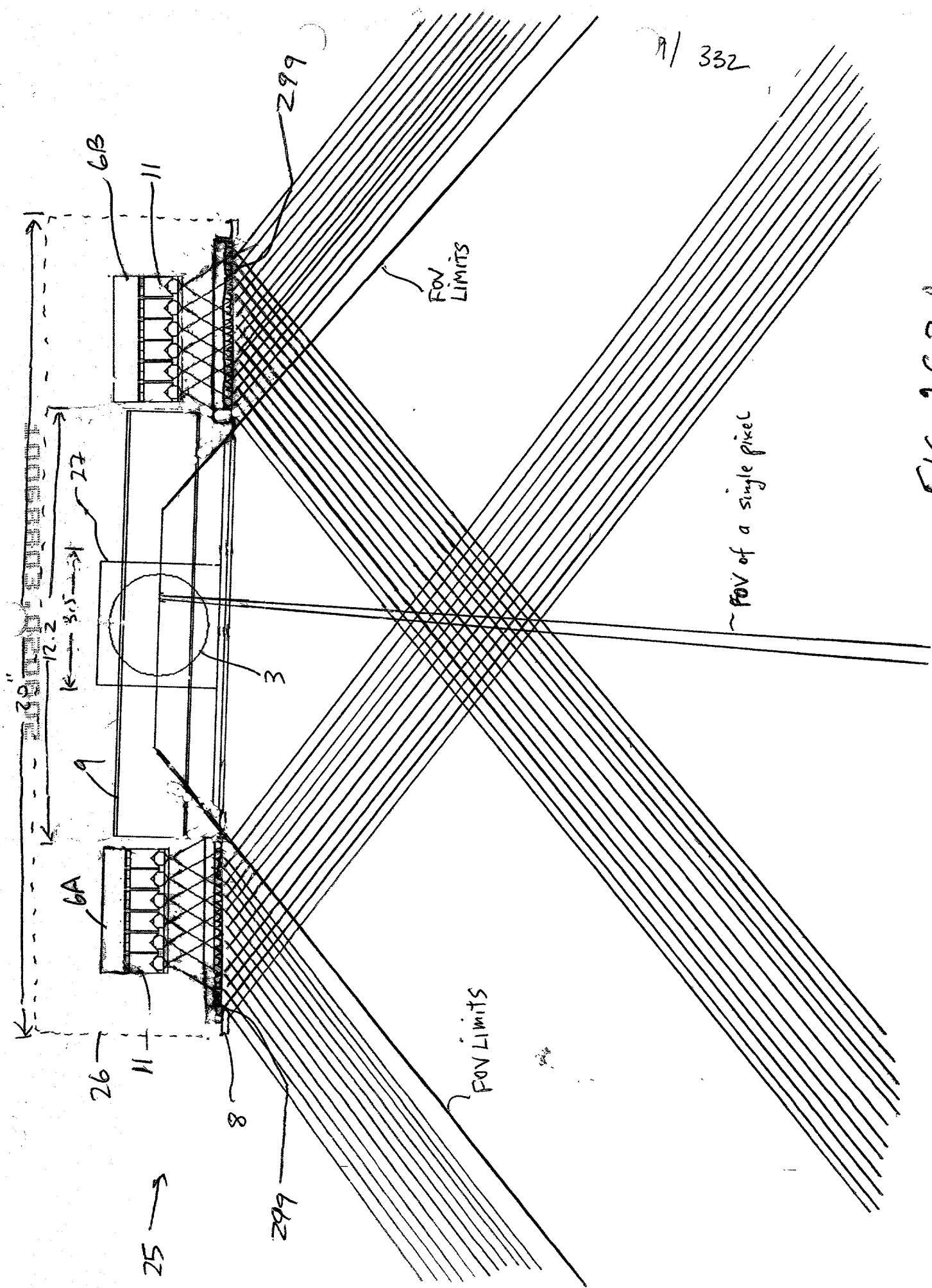


FIG. 142



9/ 332

FIG. 1G3

10068803.020602

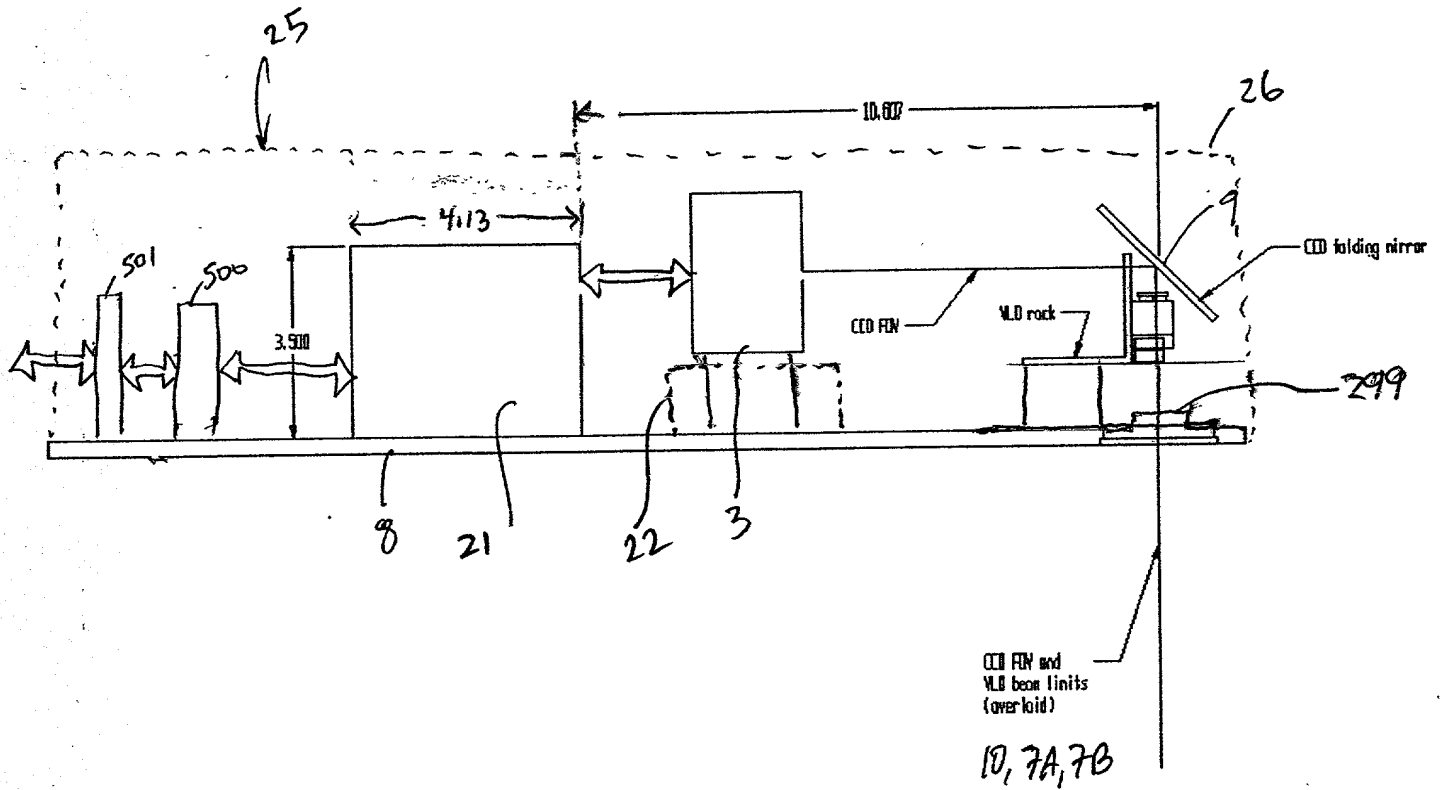
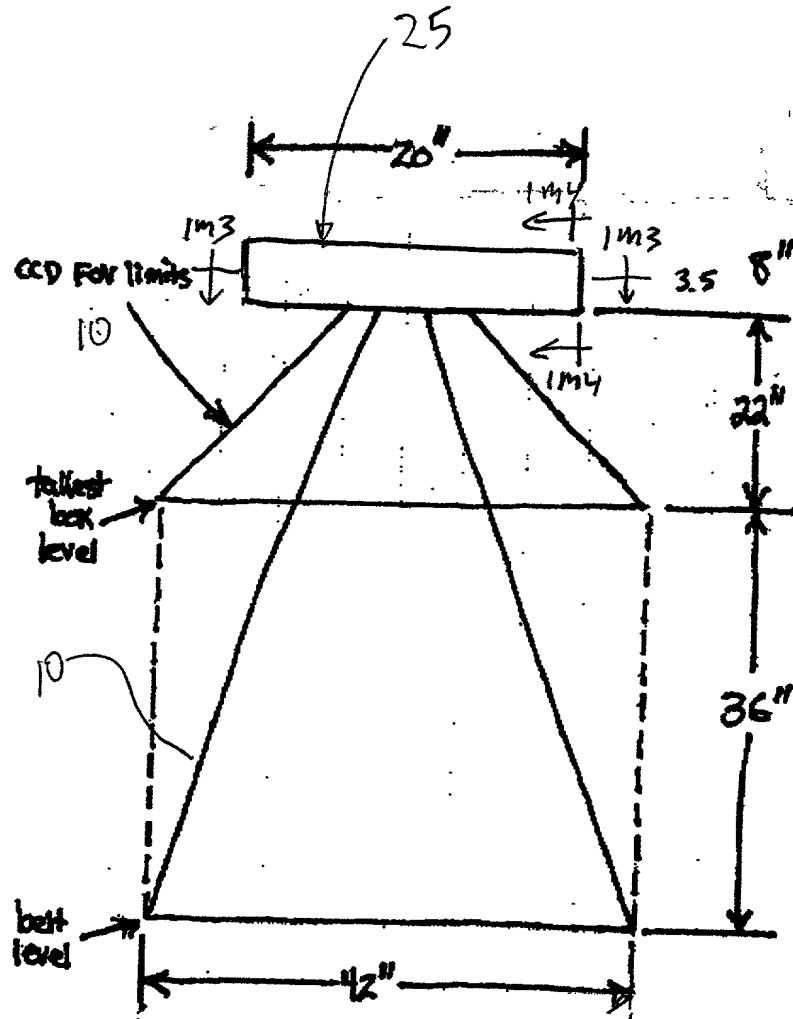


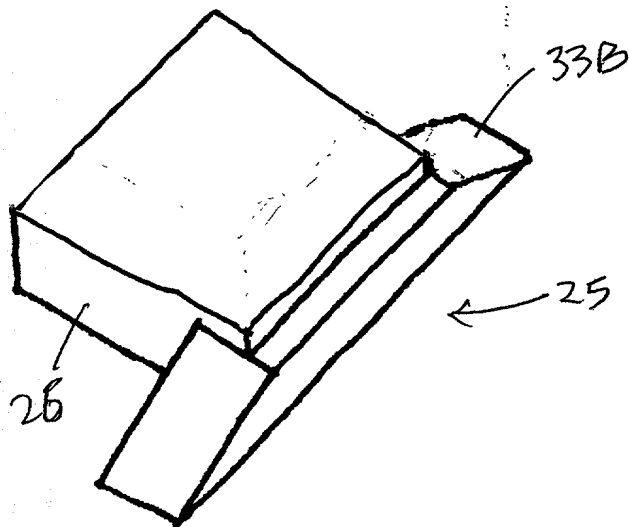
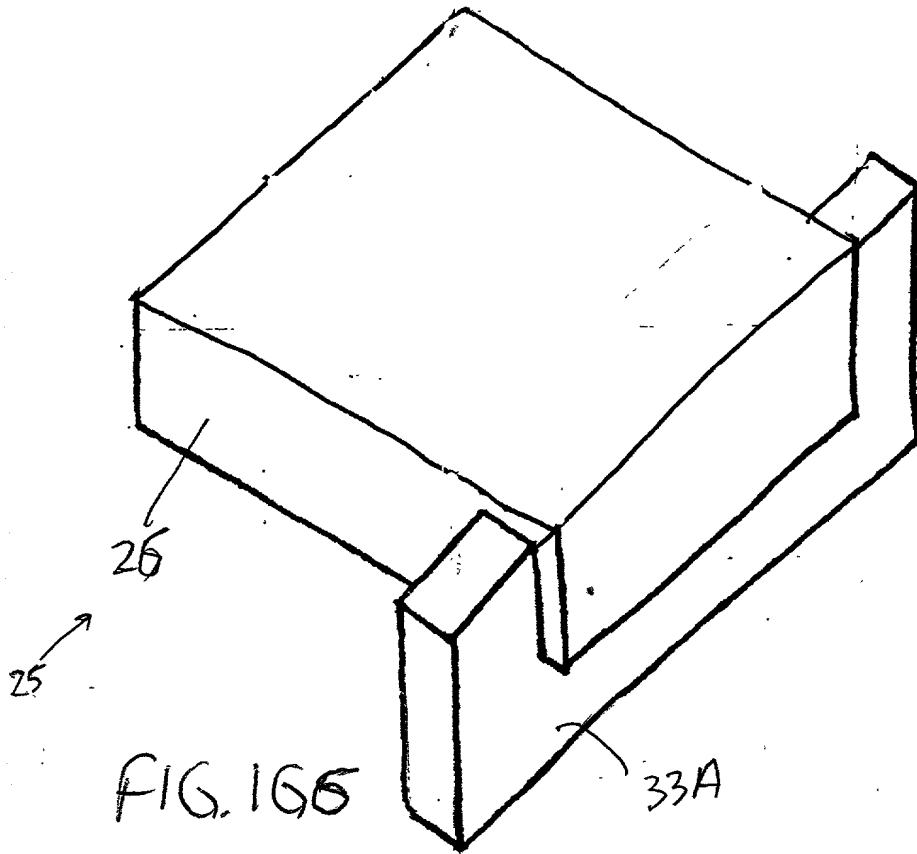
FIG. 164

11/ 332



\* Fixed Field of Field

FIG. 1G5





13/332

6A, 6B

32A

32B

FIG. 1G 8

14 L bracket 16 13 14B

VLD sticking out of block

14 block

cylindrical lens 16

32A

32B

2.000"

2.000"

FIG. 1G.9

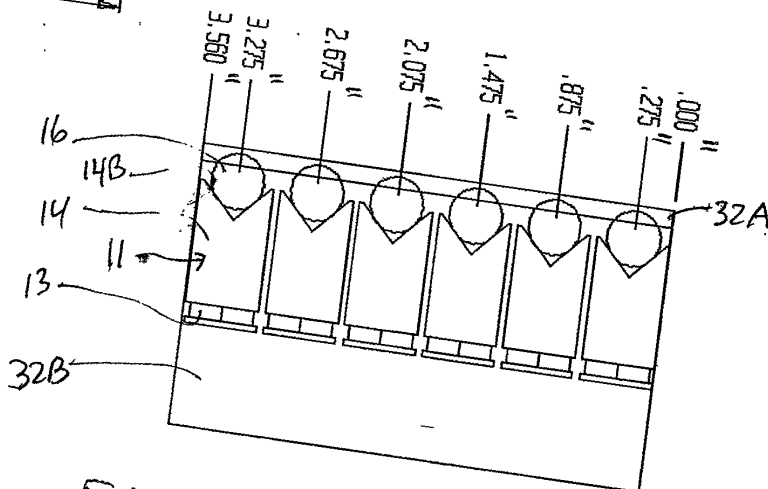


FIG. 1G.10

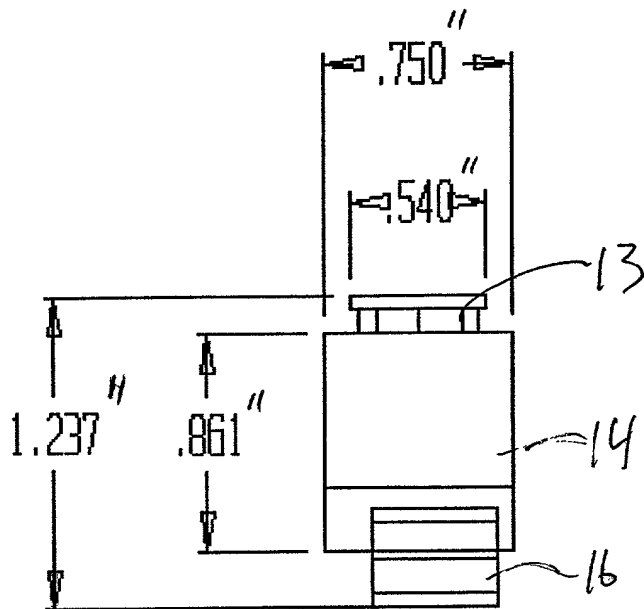


FIG. 1611

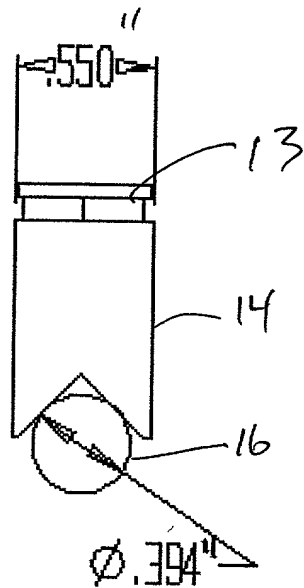


FIG. 1612

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 LIBRARY  
 540 EAST 57TH STREET  
 CHICAGO, ILL. 60637  
 312 707 3300

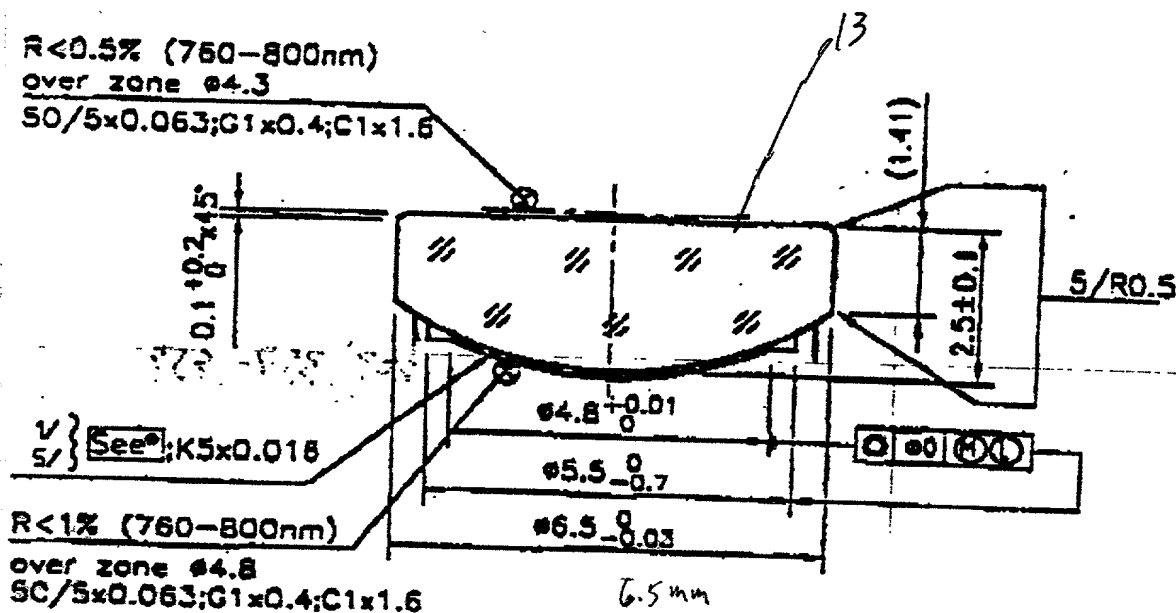


FIG. 1G13

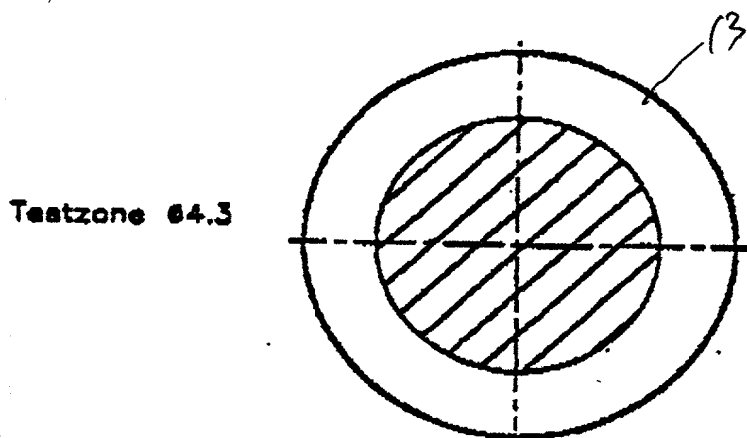


FIG. 1G14

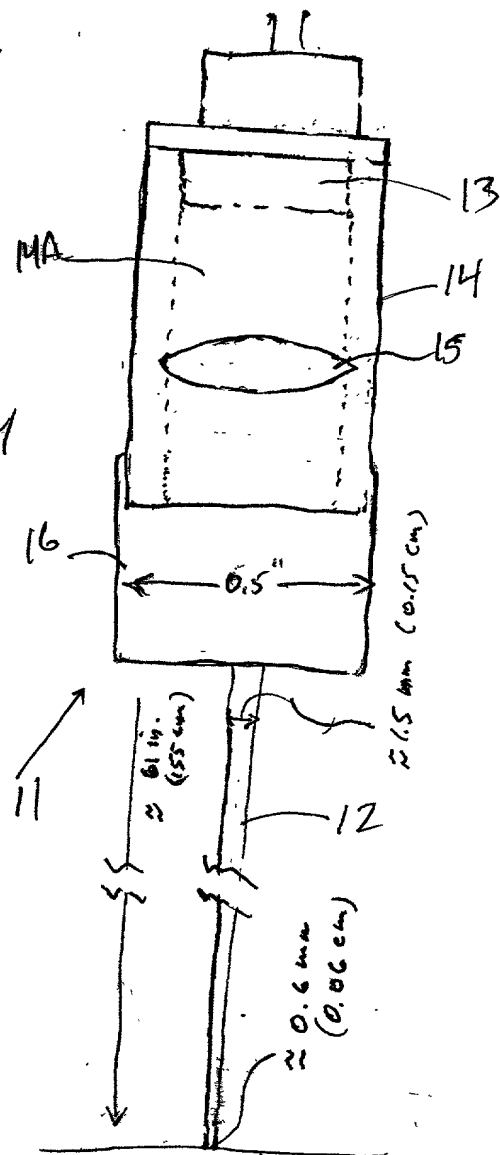
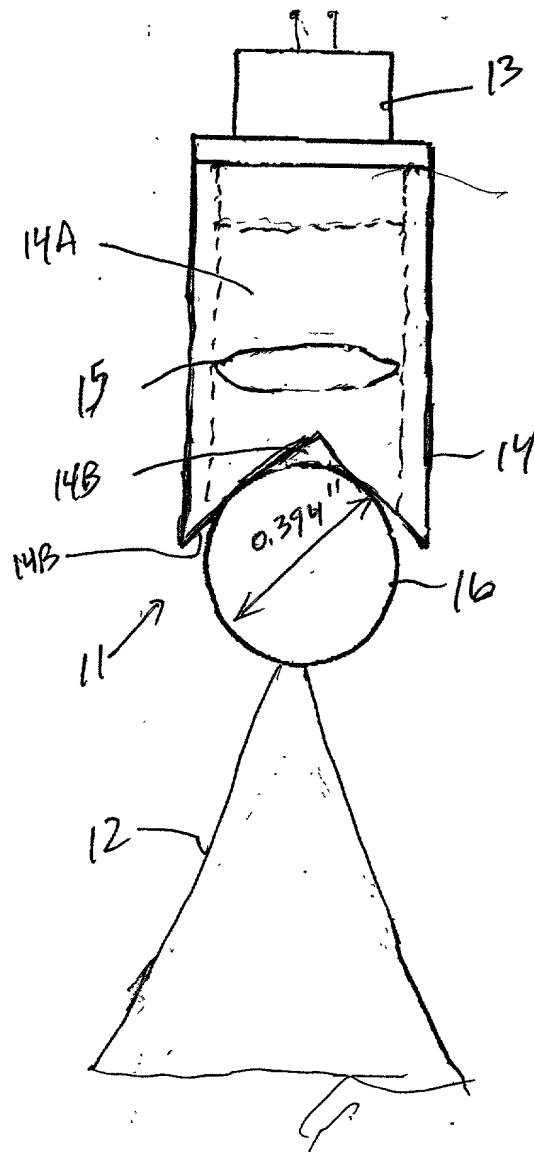


FIG. 1G15A

FIG. 1615B

furthest  
object/walking  
distance

17/ 332

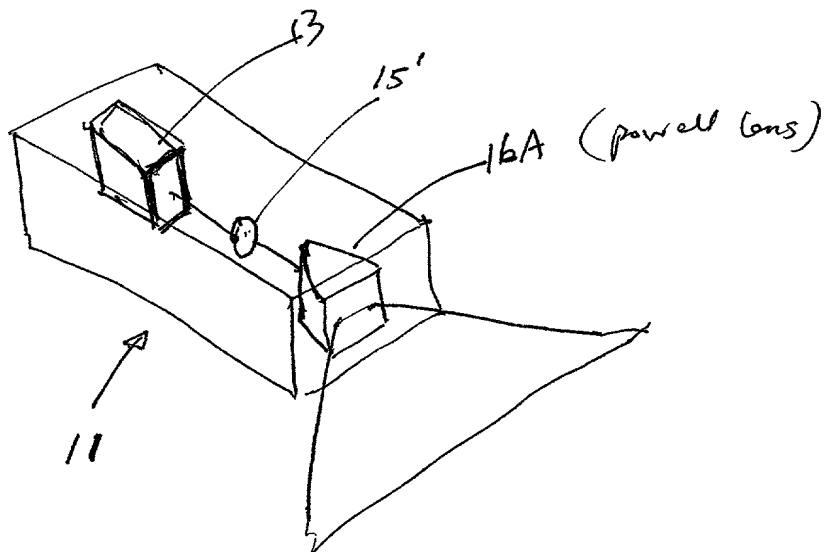


FIG. 1G.16A

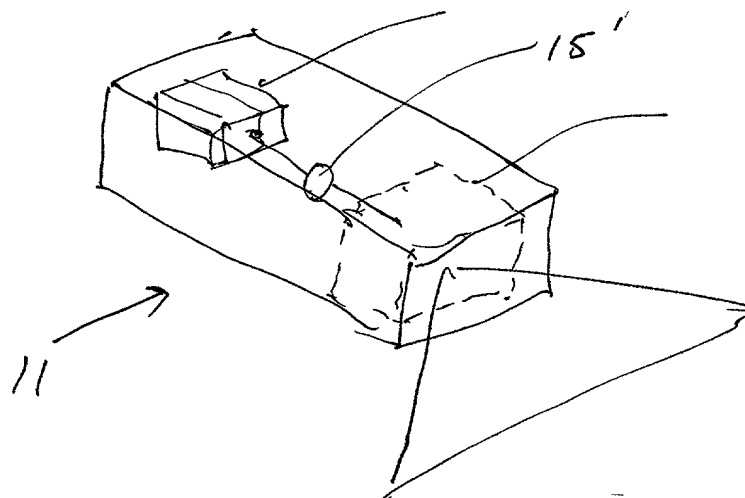


FIG. 1G.16B

PLIM w/  
powell lens

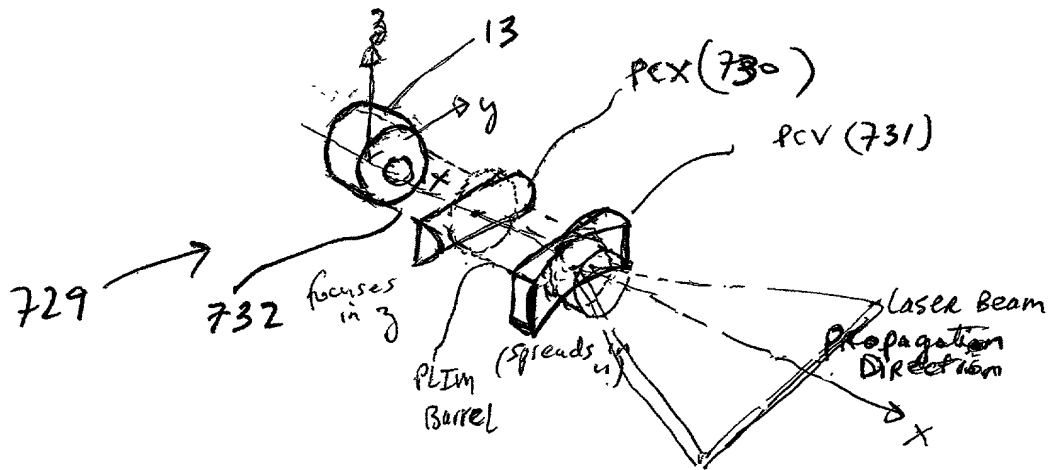


FIG. 16.17A

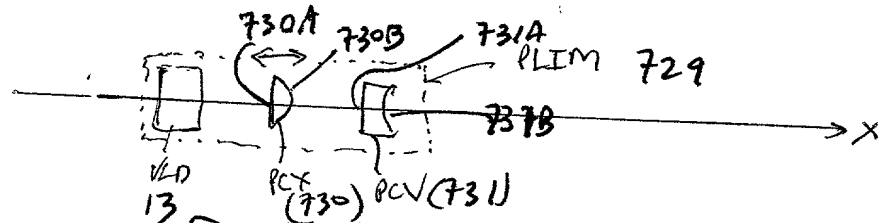


FIG. 16.17B

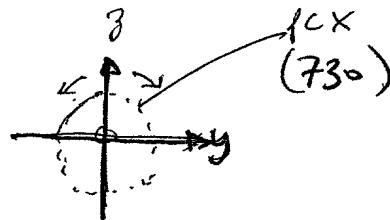


FIG. 16.17C

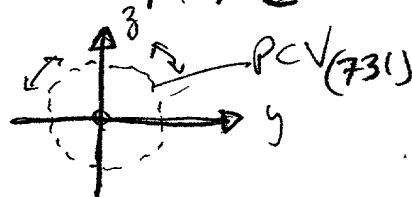


FIG. 16.17D

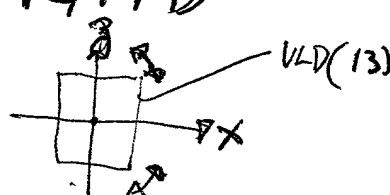


FIG. 16.17E

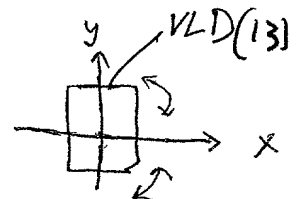


FIG. 16.17F

19/ 332

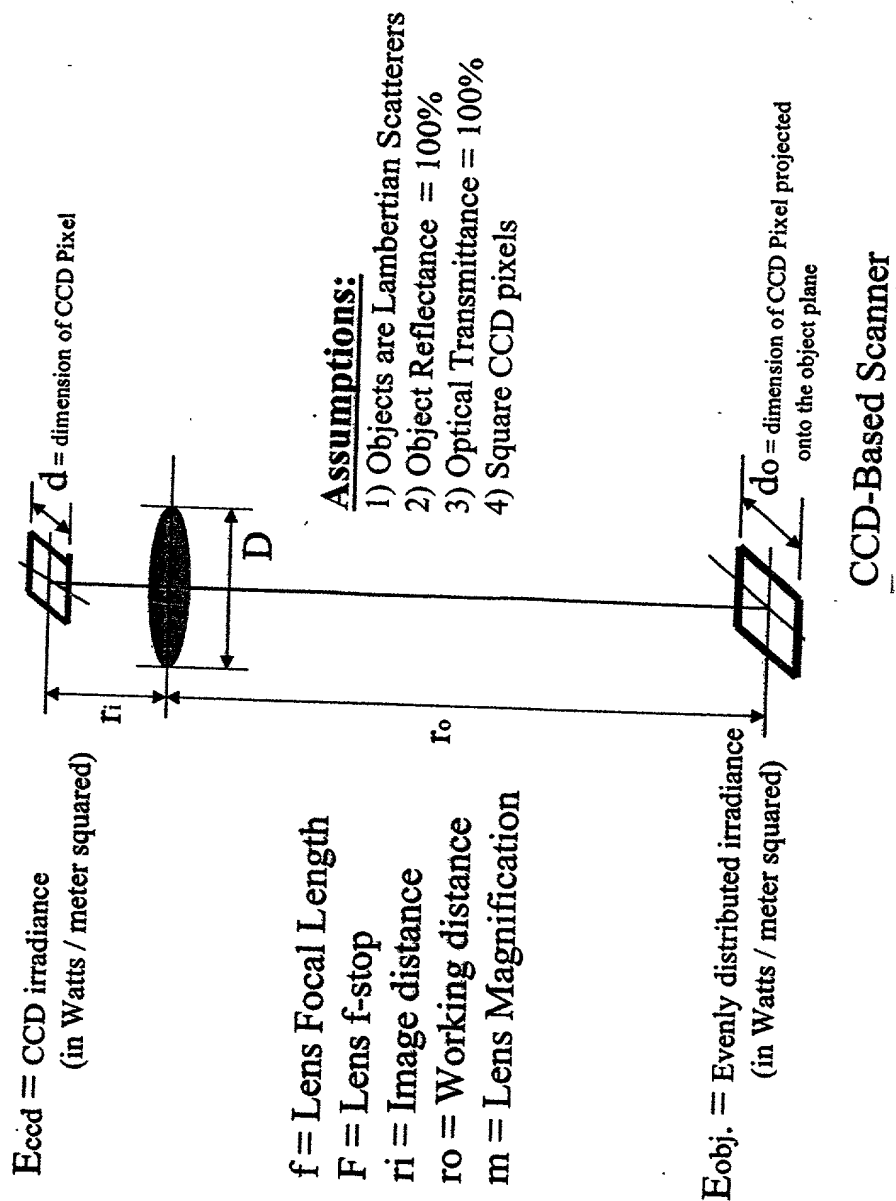


FIG. 1H6

FIRST GENERALIZED METHOD  
OF REDUCING SPECKLE-NOISE  
PATTERNS AT IMAGE  
DETECTION ARRAY OF THE  
SPM SUBSYSTEM (3)

20/ 332

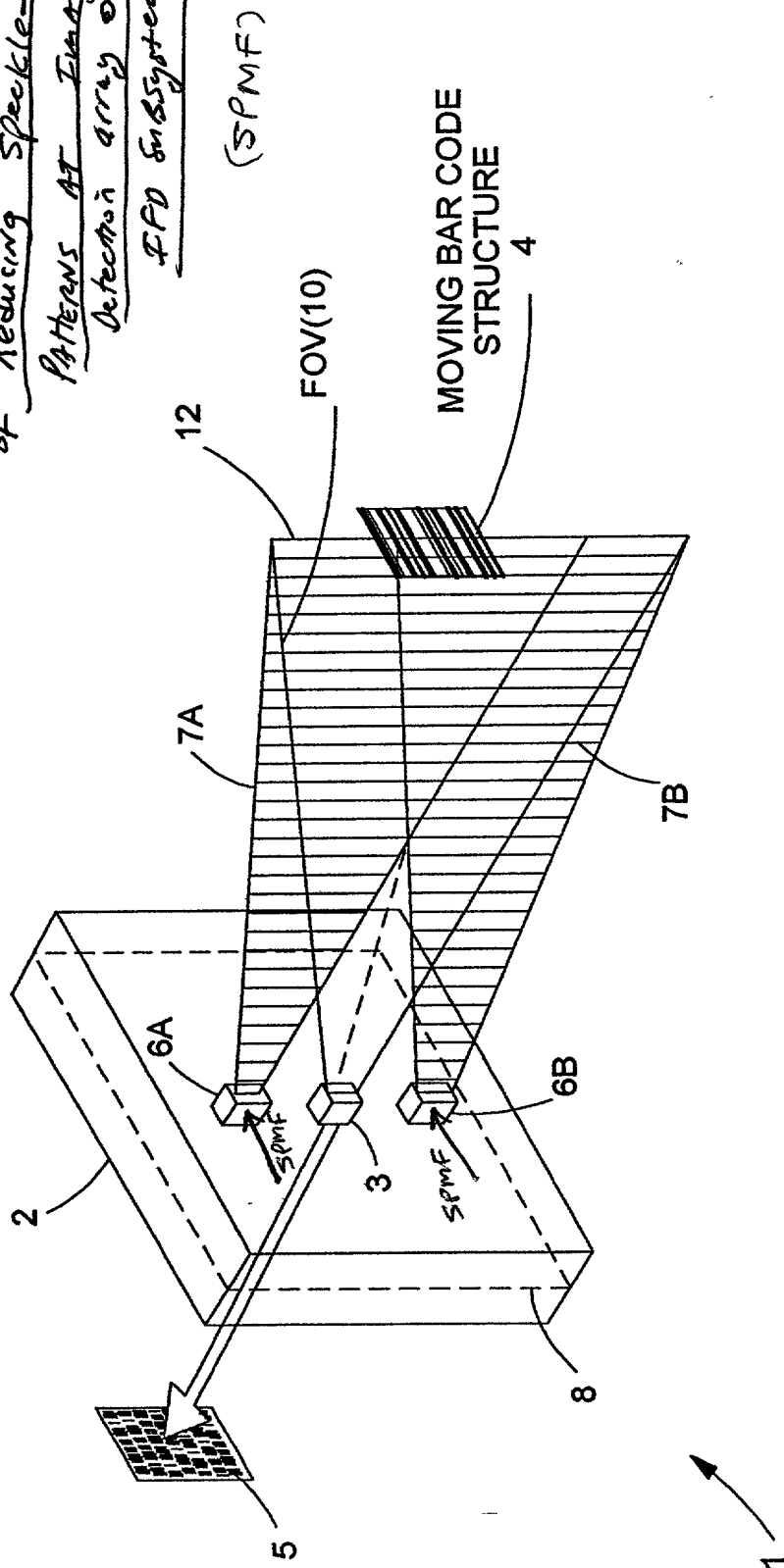


FIG. 1I1





**The First Generalized Speckle-Noise Pattern Reduction Method**  
**Of The Present Invention**

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial phase of the transmitted PLIB along the planar extent thereof according to a spatial phase modulation function (SPMF) so as to produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the power of the speckle-noise pattern observed at the image detection array.

FIG. 1I2B

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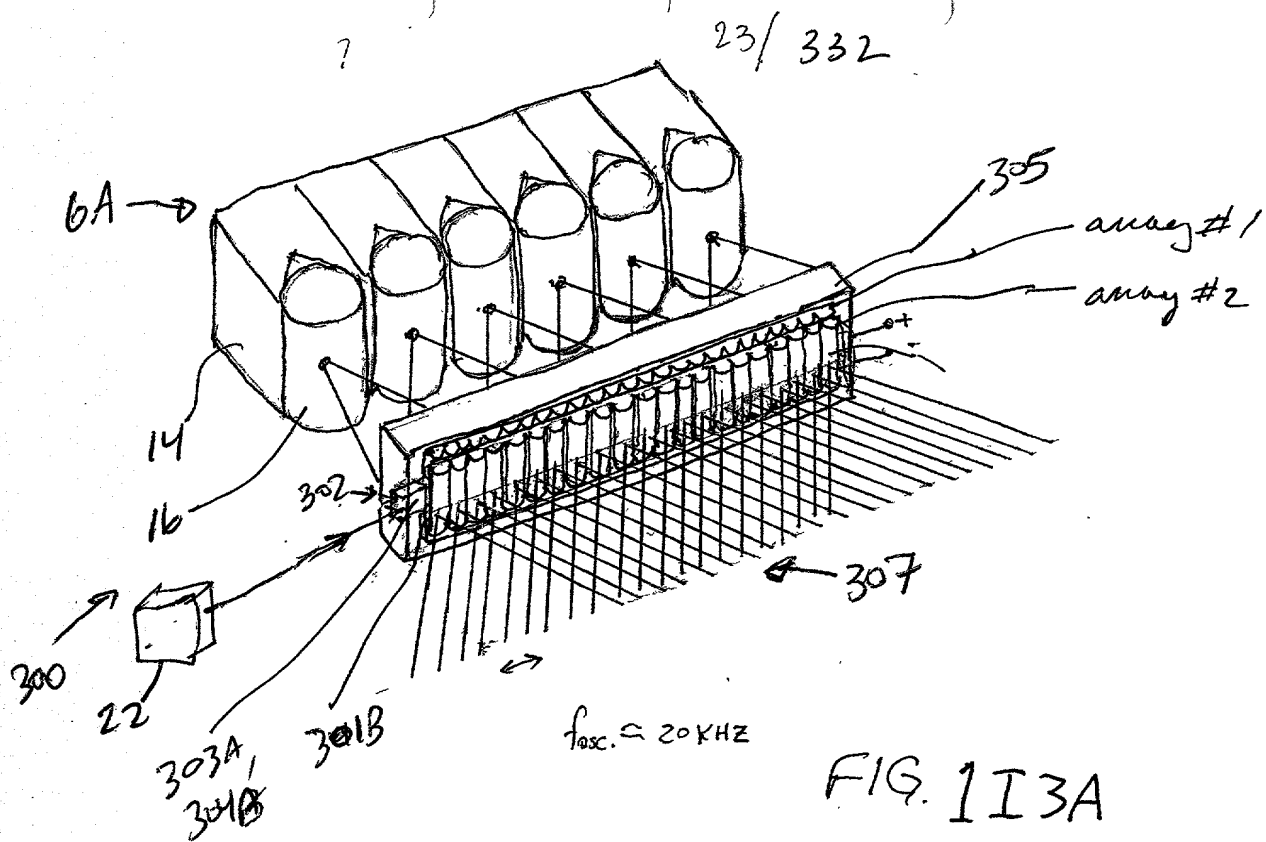


FIG. 113A

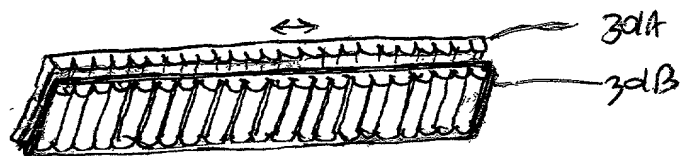


FIG. 113B

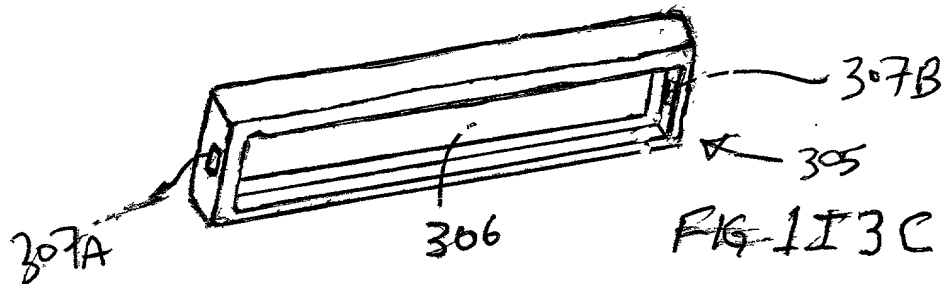


FIG-1I3C

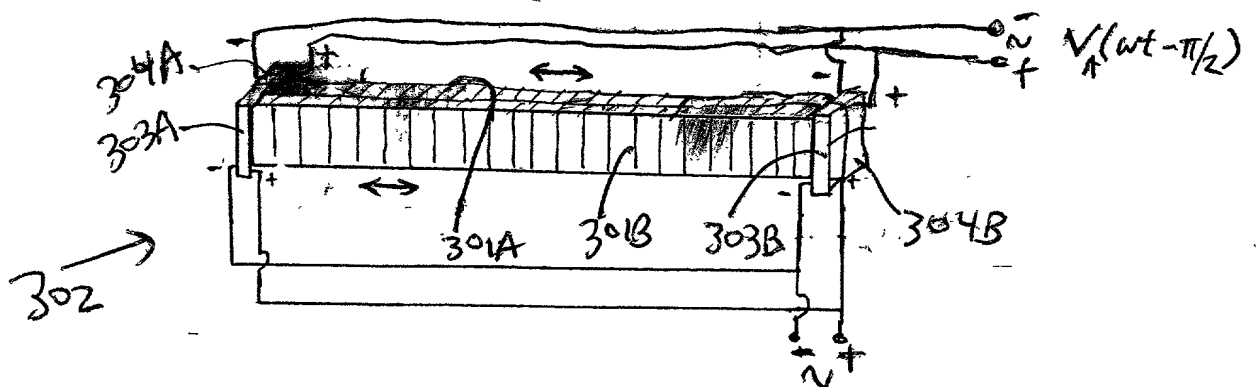


FIG. 113D  $V(wt)$

24/ 332

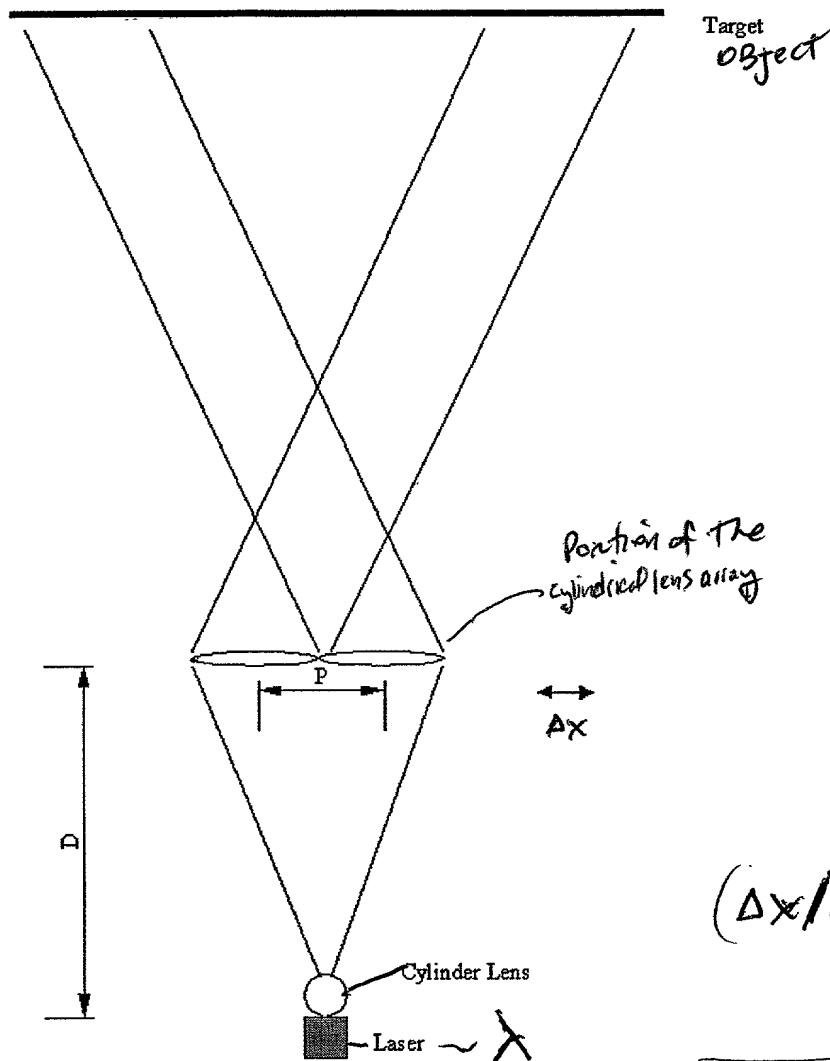


Figure 1

$$(\Delta x / D) P = \lambda$$

$$\Delta x \geq \frac{\lambda \cdot D}{P}$$

FIG. 1 I 3 E

25/ 332

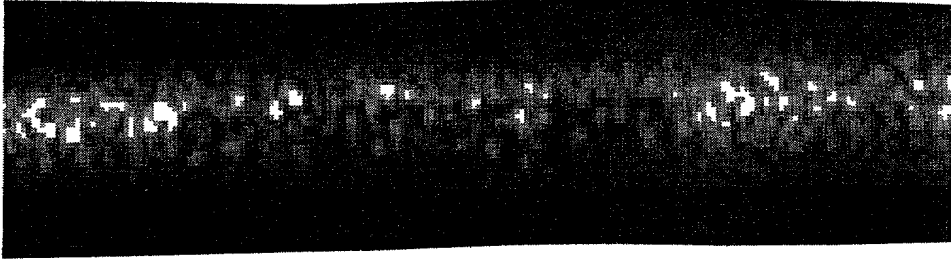


FIG. 1I3F

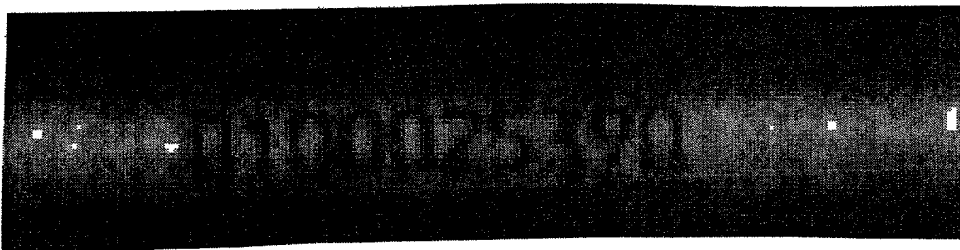
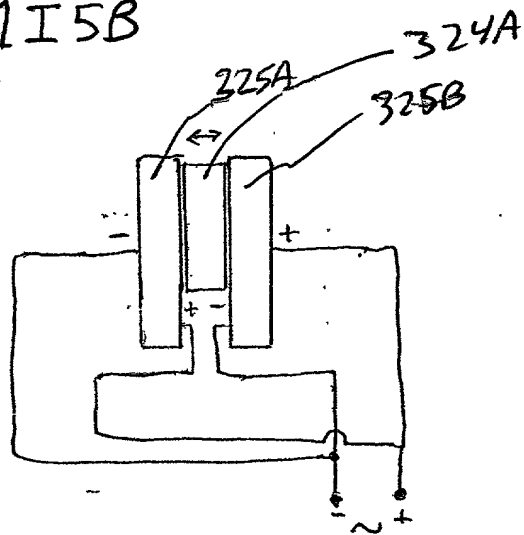
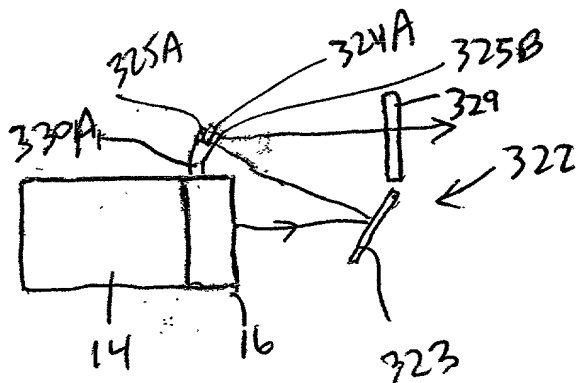
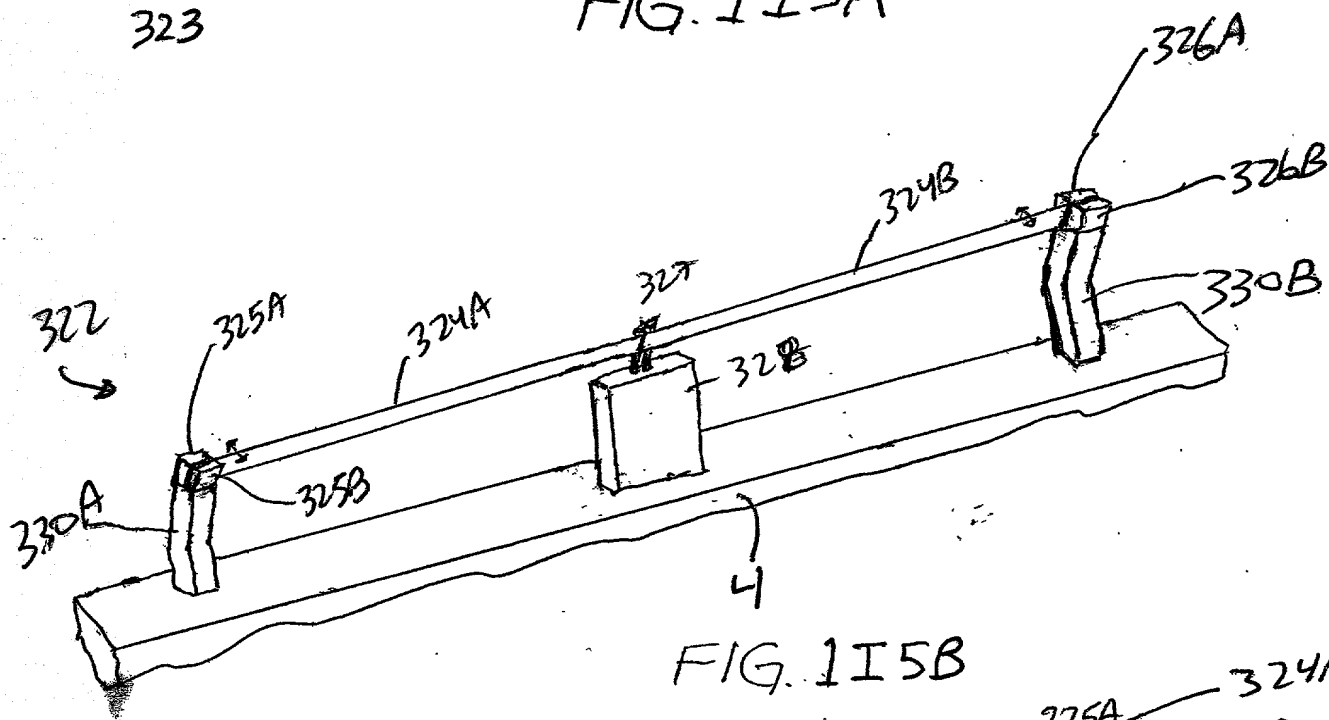
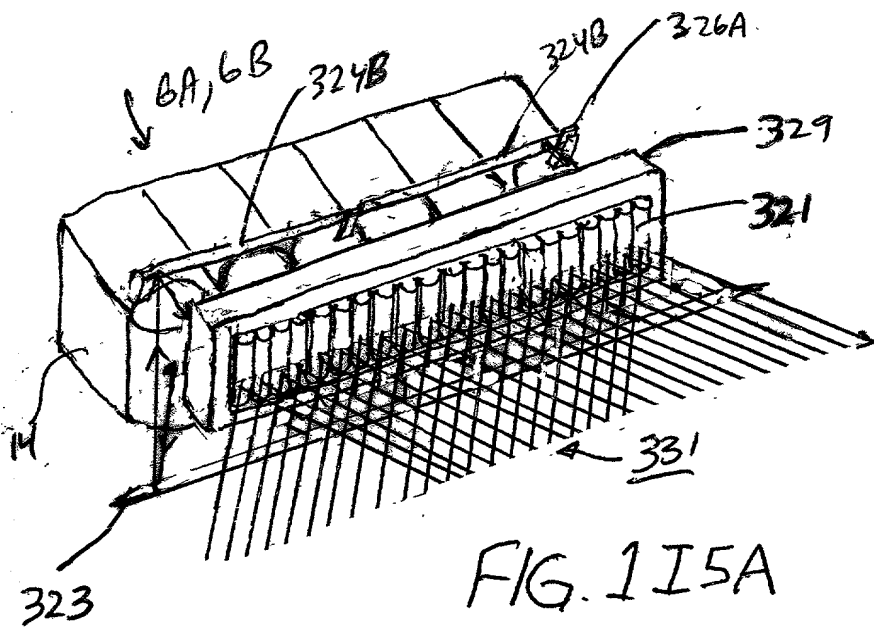
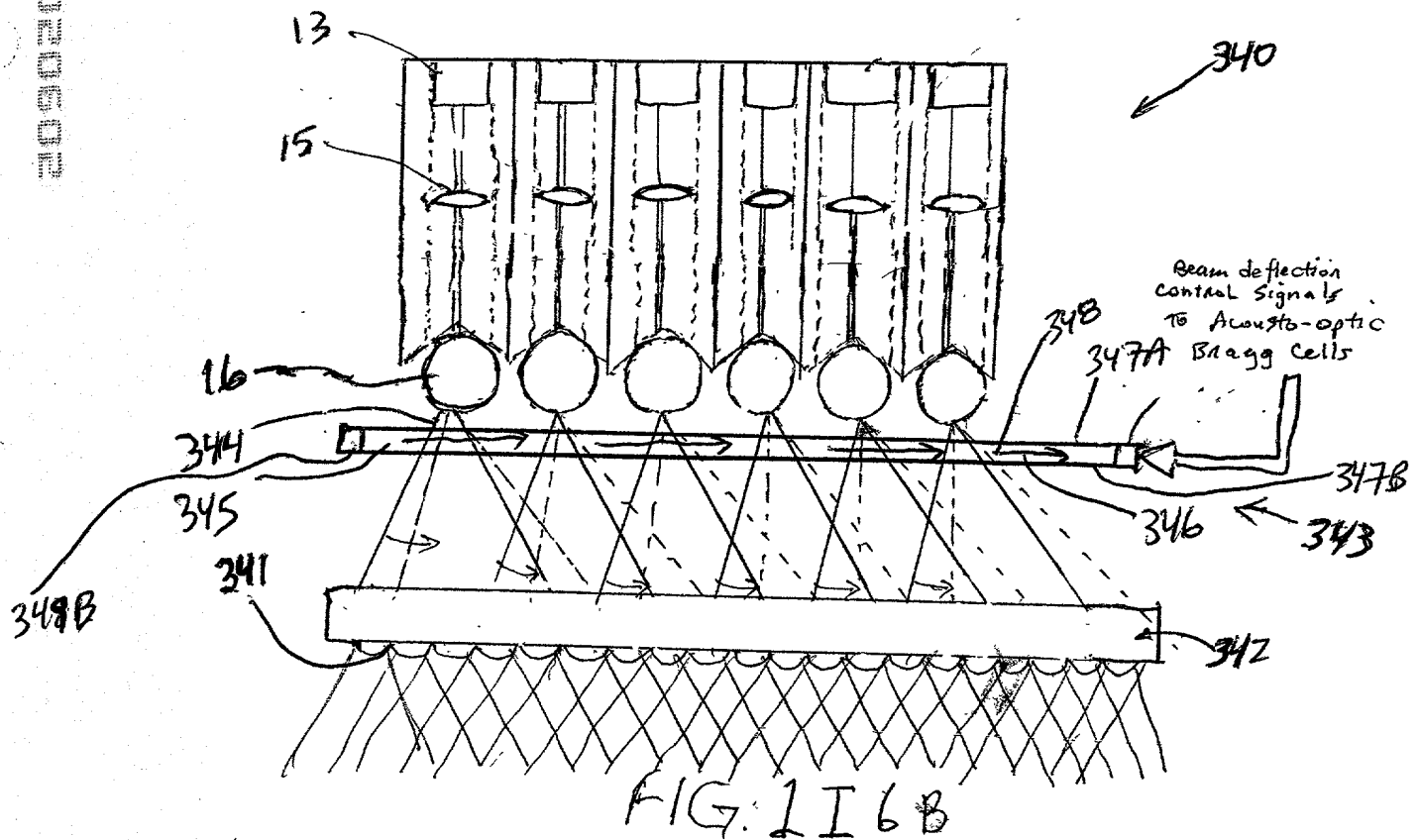
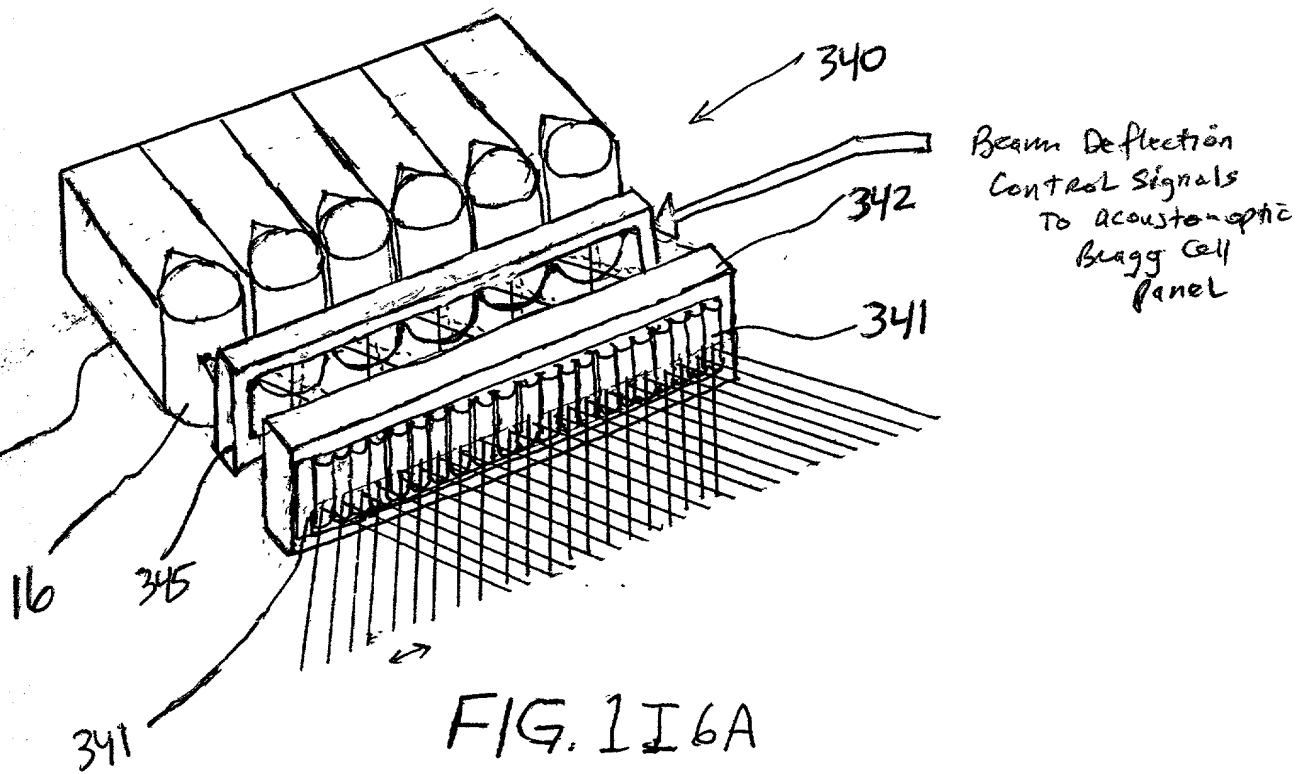


FIG 1I3G

40068603-020602

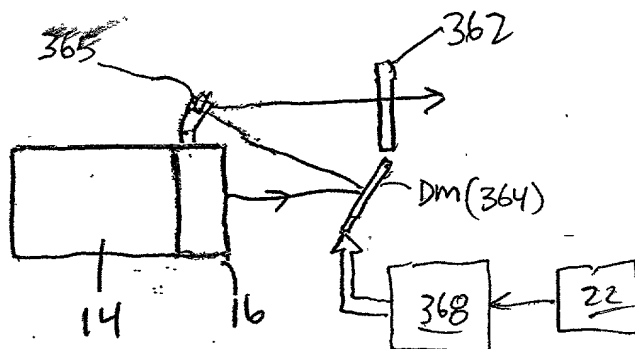
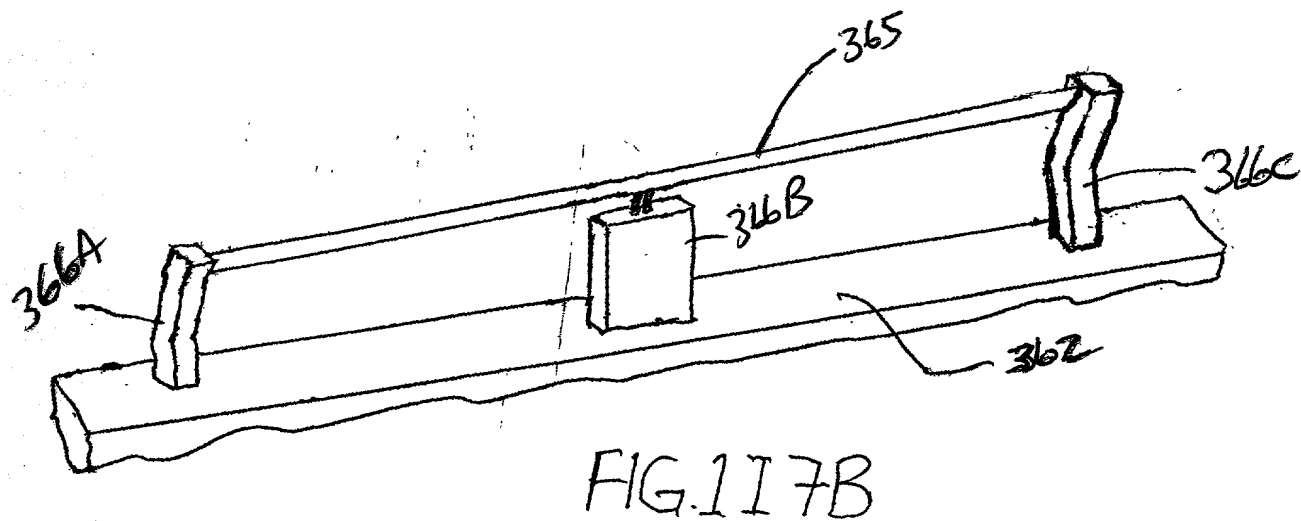
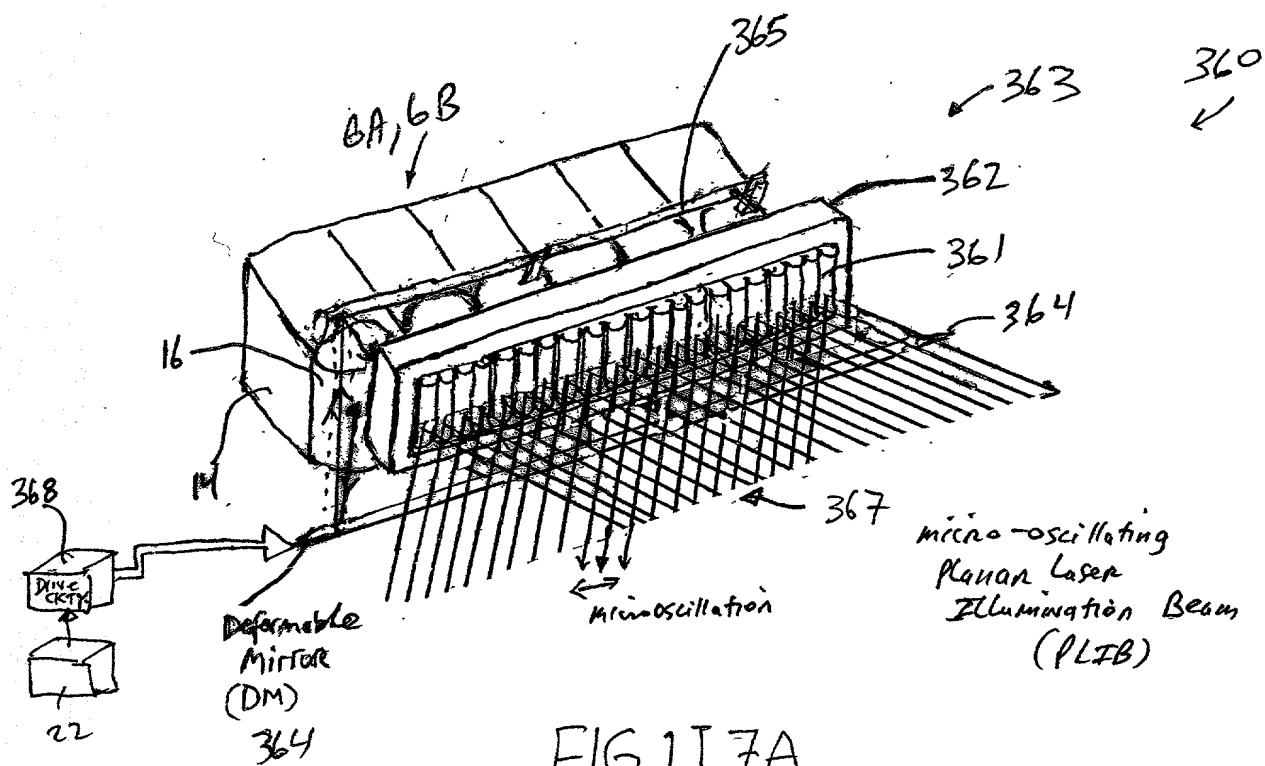








10068803-020602



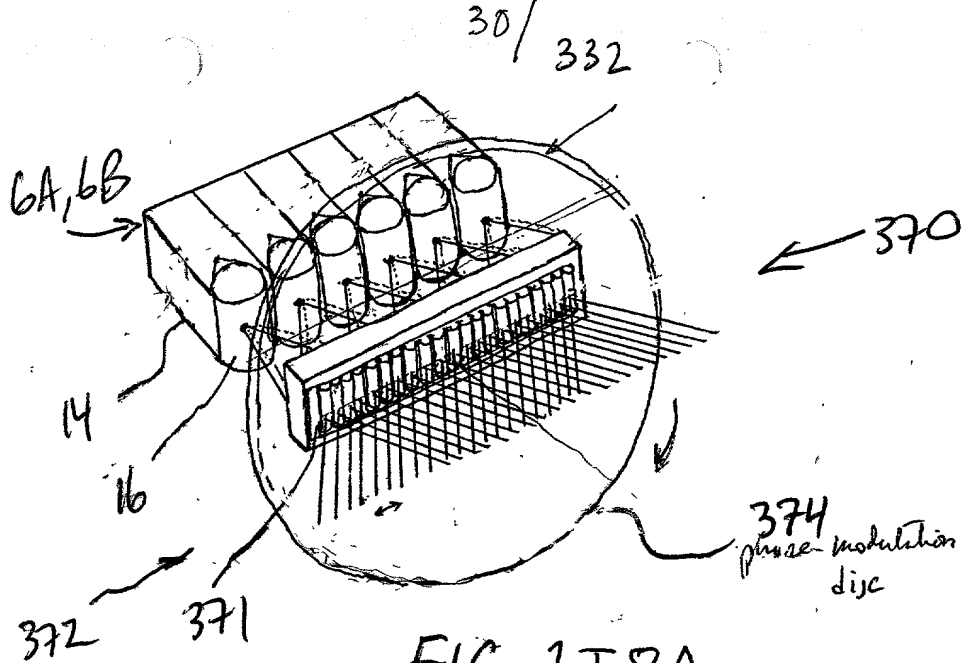


FIG. 1I8A

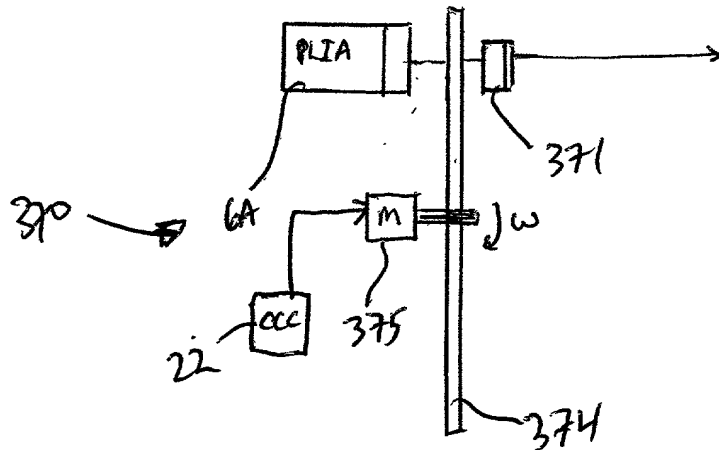


FIG. 118B

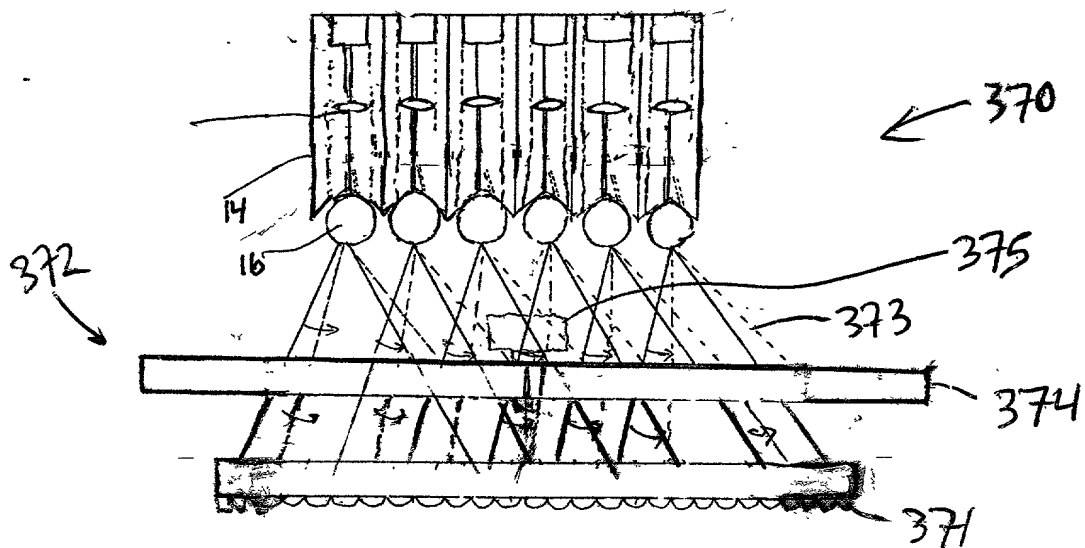
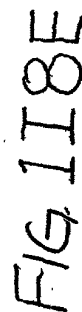
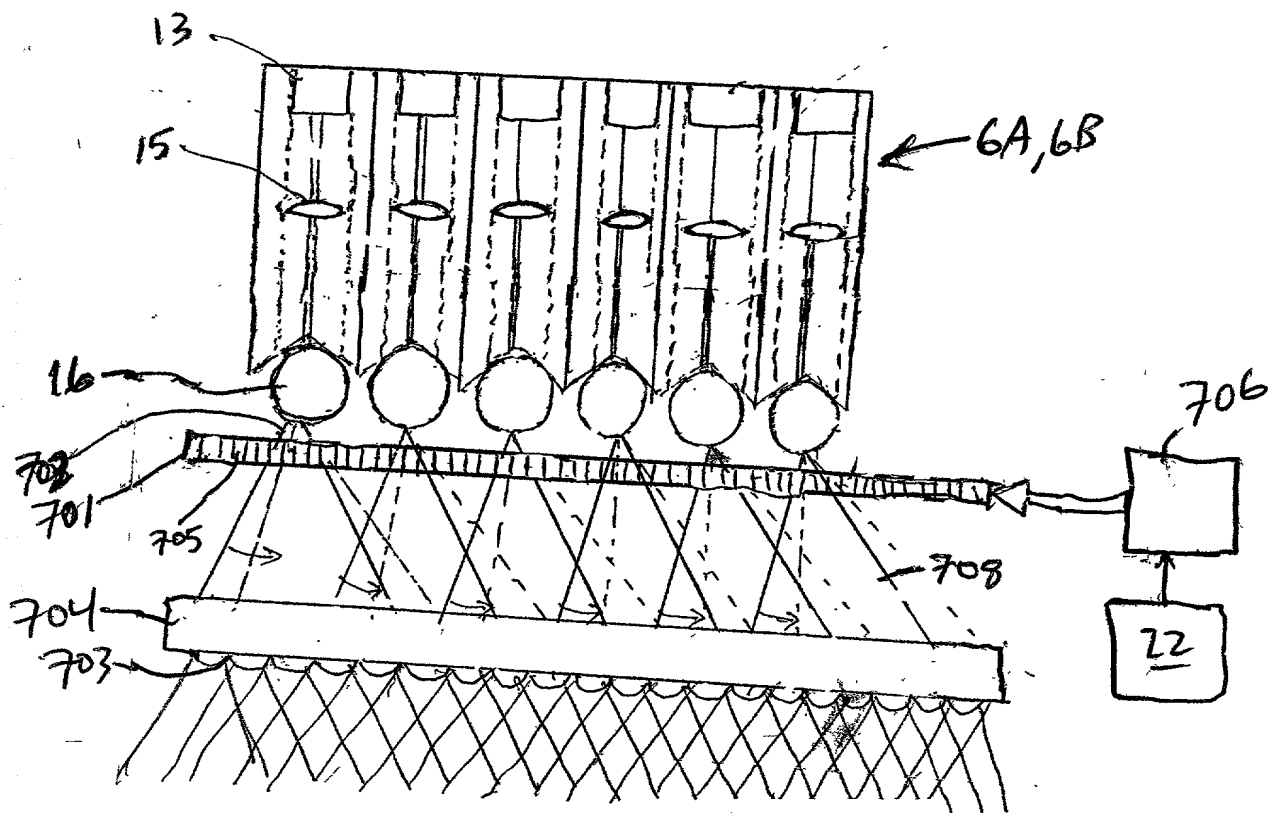
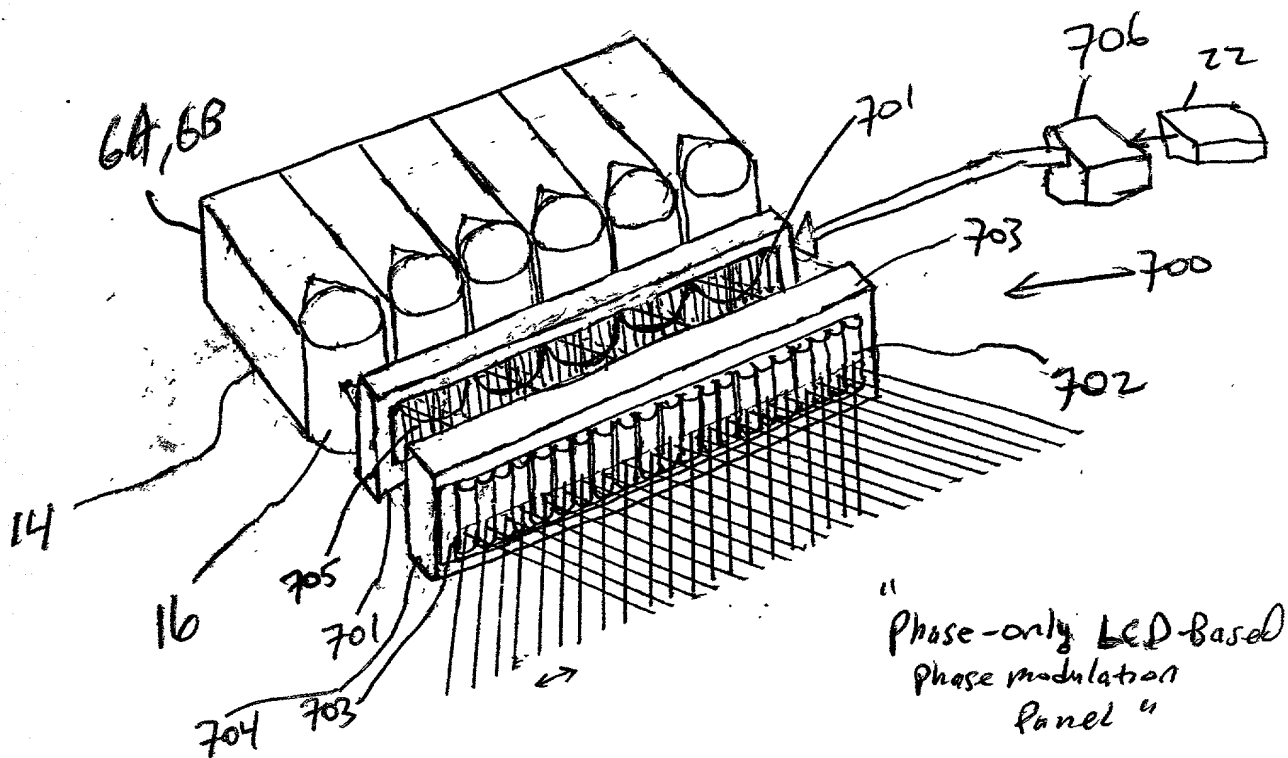
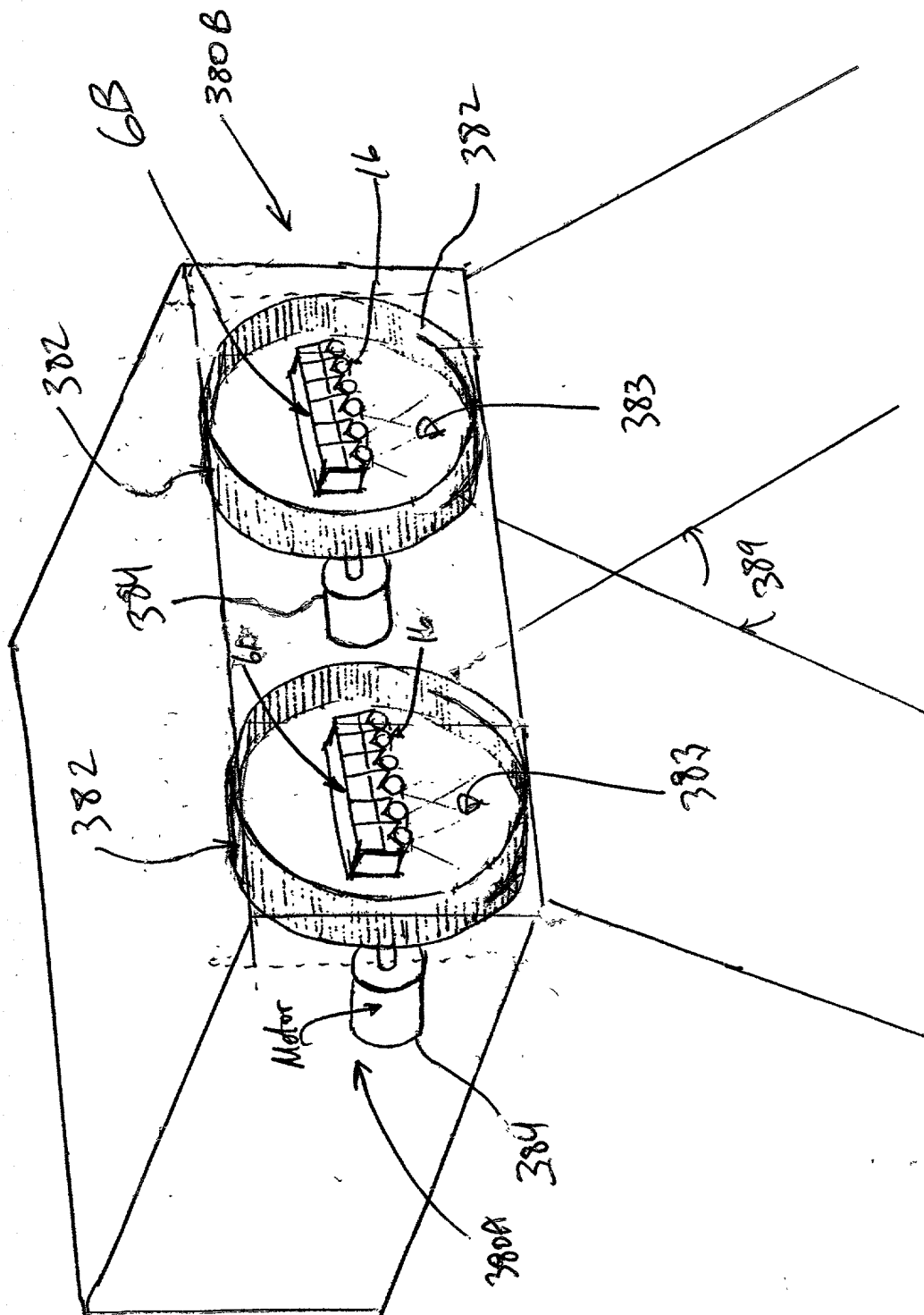


FIG. 1I8C

31/332





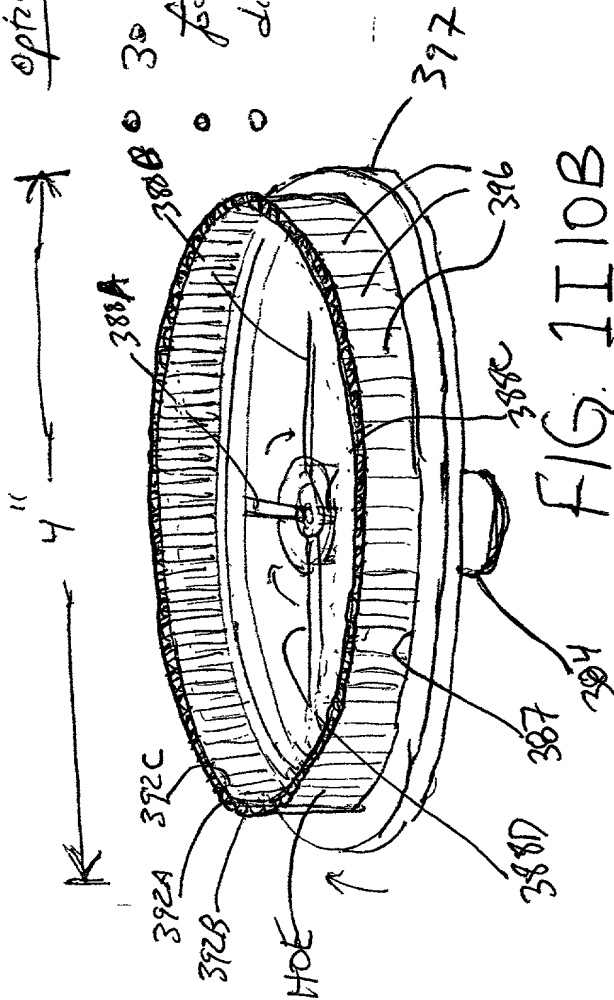






Optical Specifications:

- 30 cylindrical lens (lines) per linear inch
- total length : 2.0 millimeters
- diameter of cylindrical carousel  $\approx 44$  inches









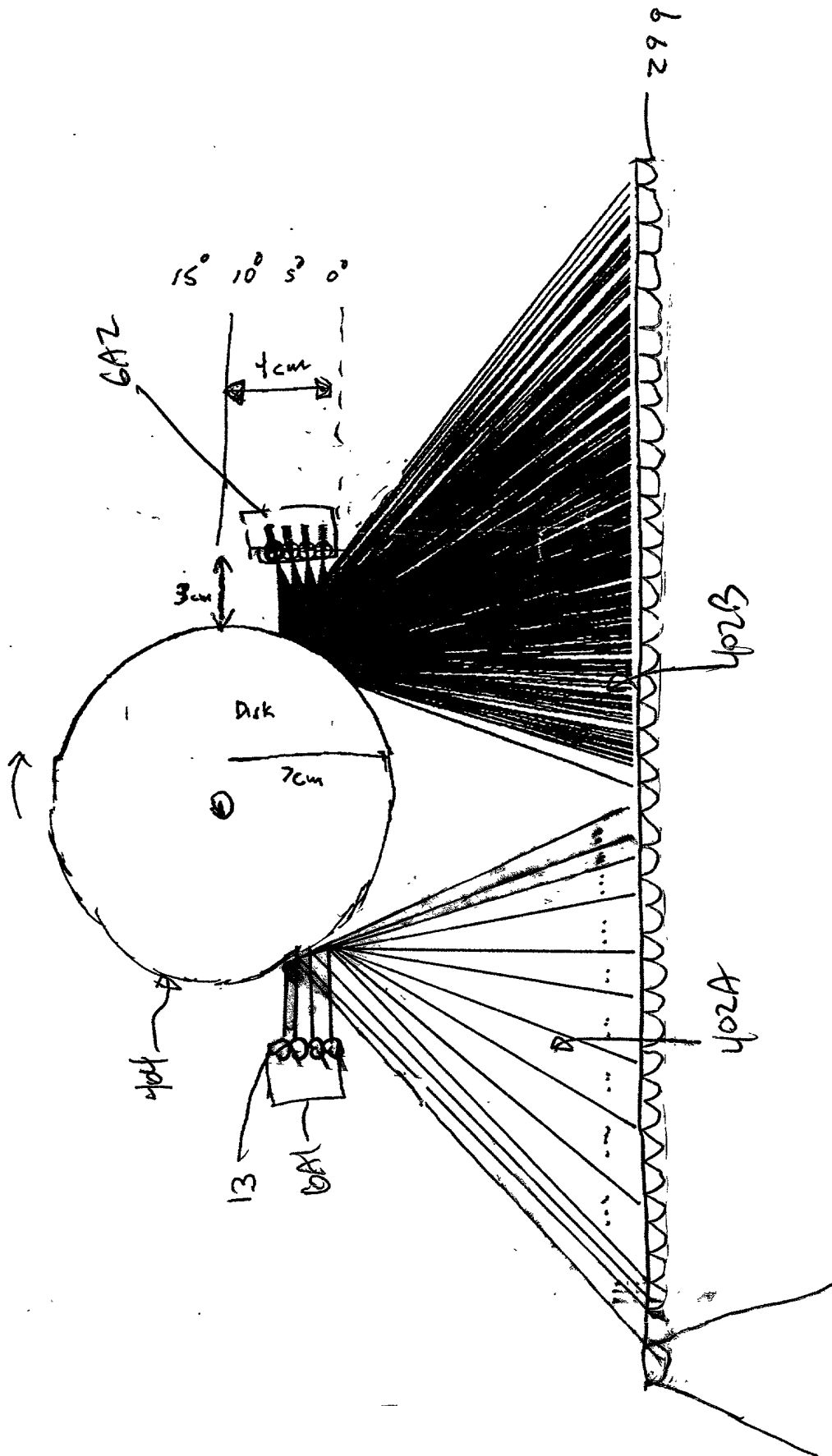
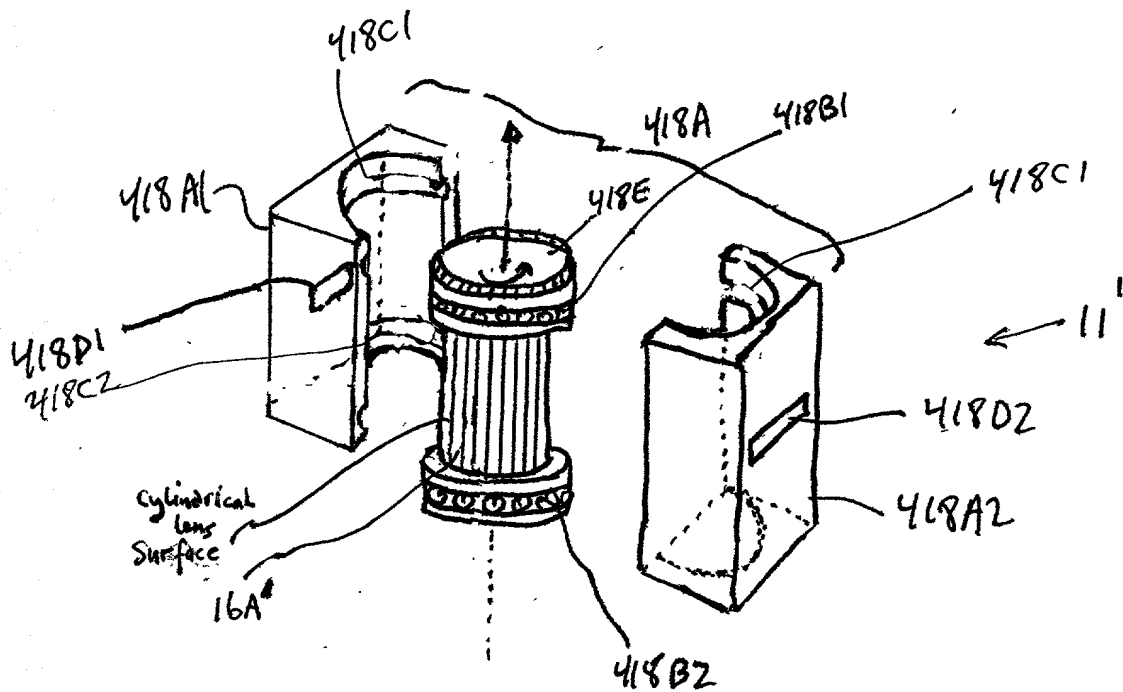
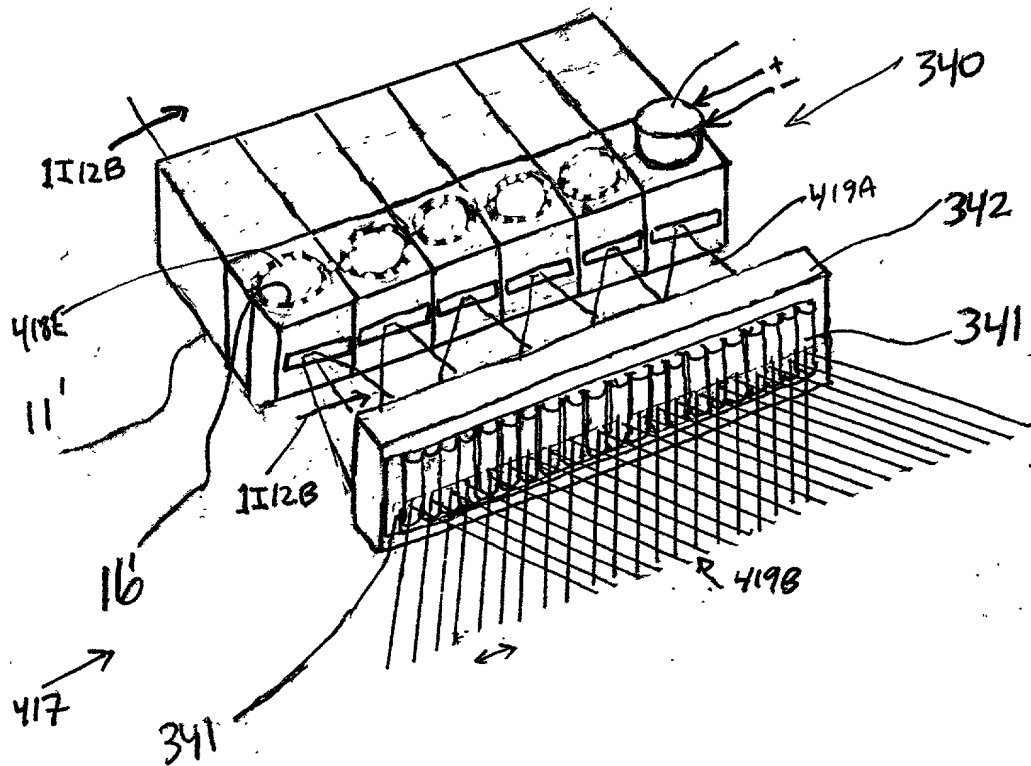


FIG. 111C



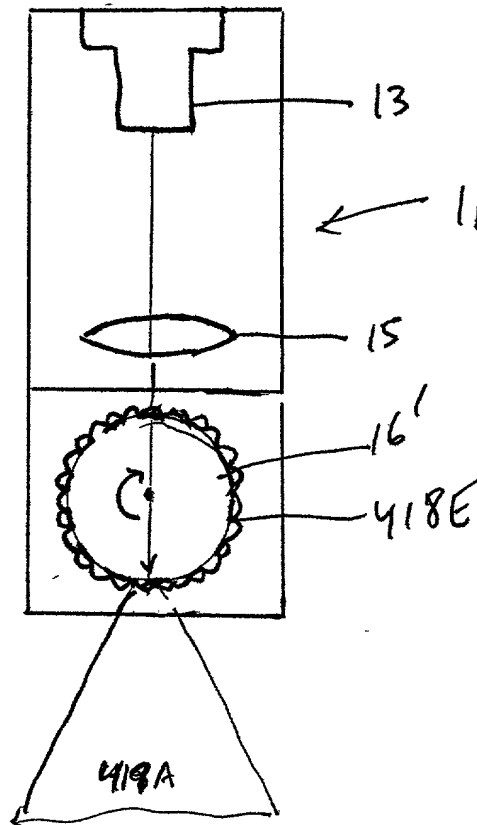


FIG. 1I12C

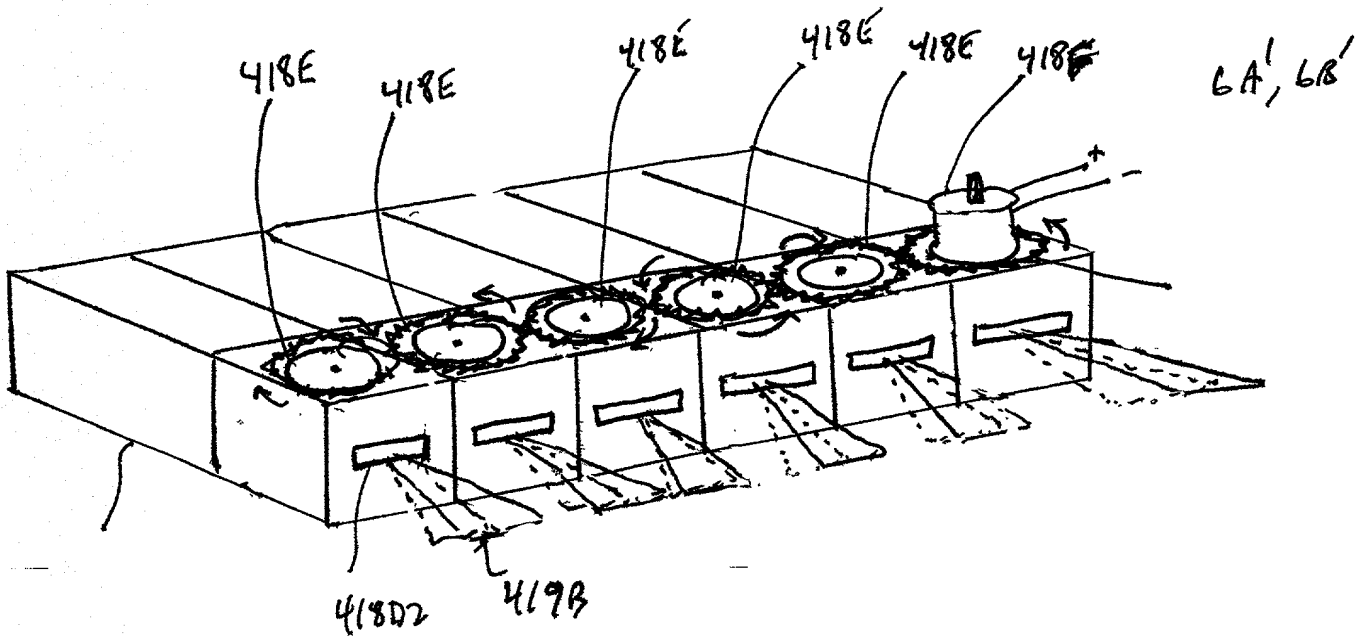


FIG. 1I12D

Second Generalized method of  
Reducing Speckle-Noise Patterns  
at Image Detection Array  
of the FPD Subsystem (3)

42/332

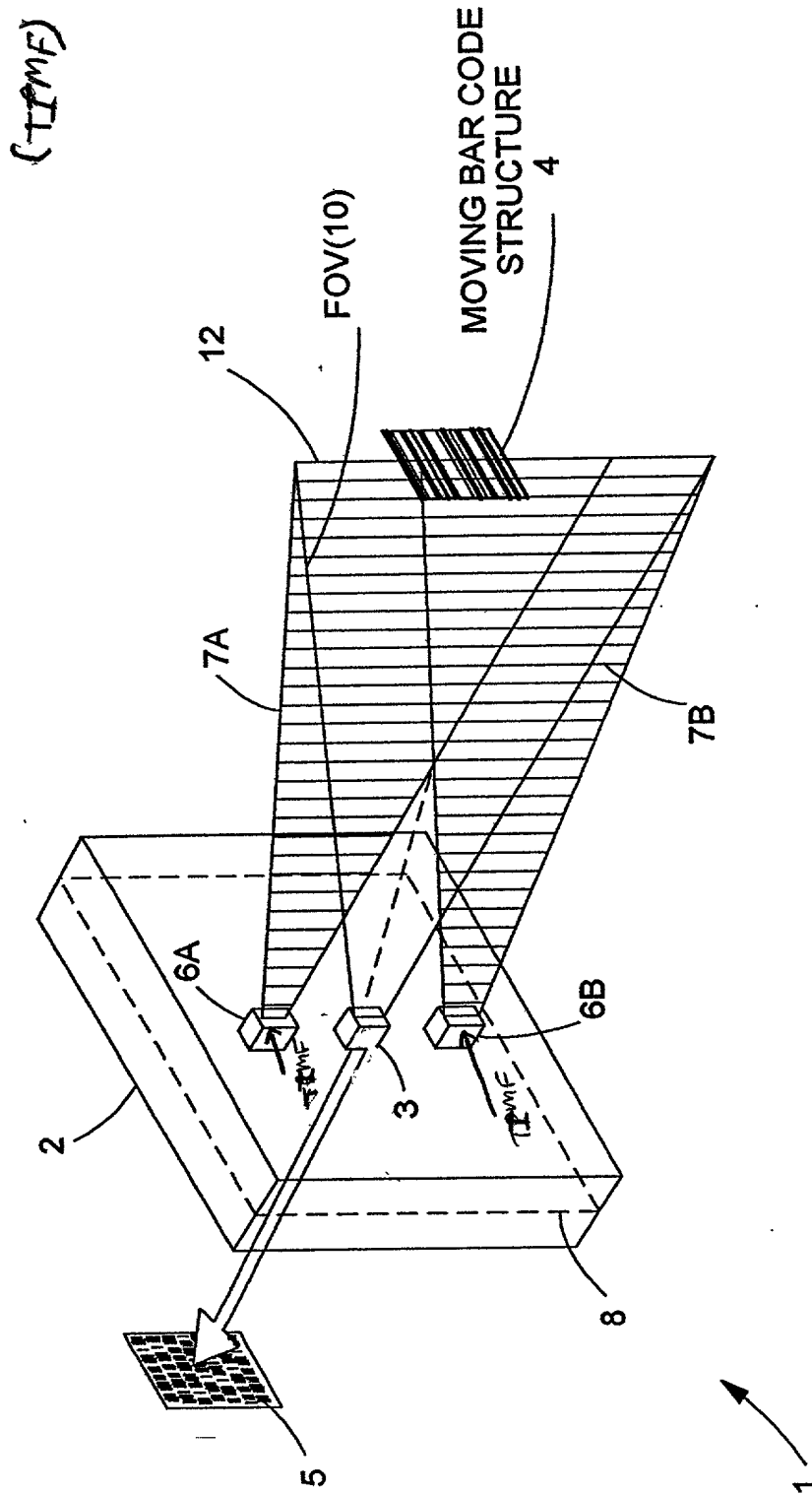


FIG. 1113

43/332

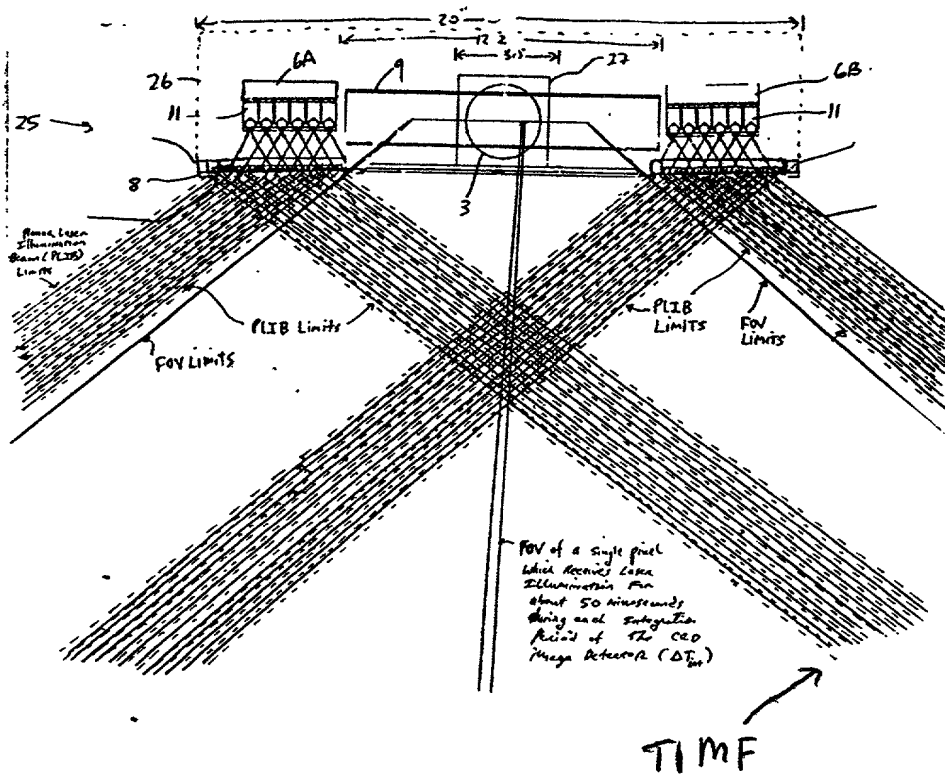


FIG. 1 I 13A

44/332

**The Second Generalized Speckle-Noise Pattern Reduction Method**  
**Of The Present Invention**

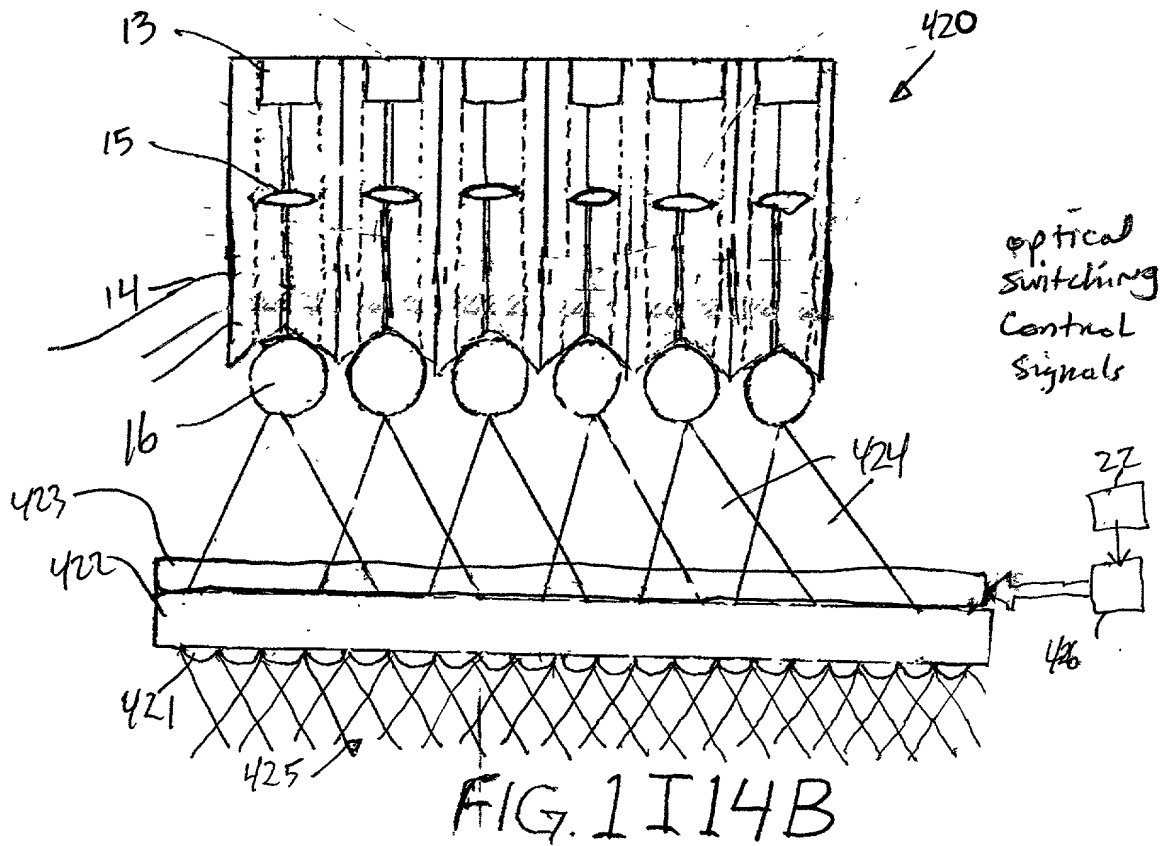
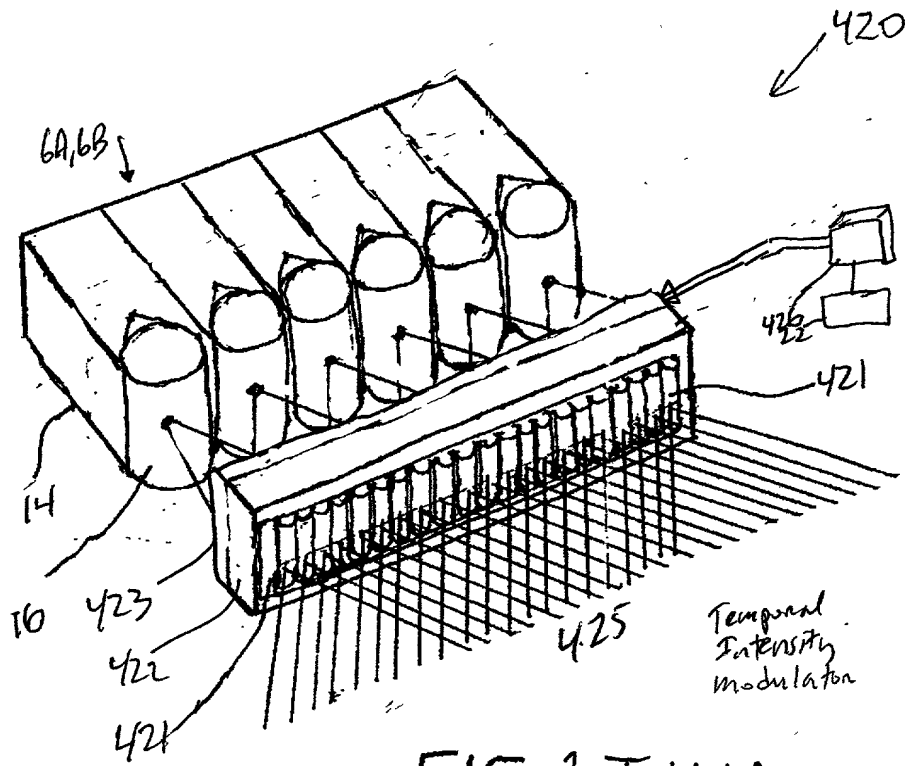
Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the transmitted PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I/3B





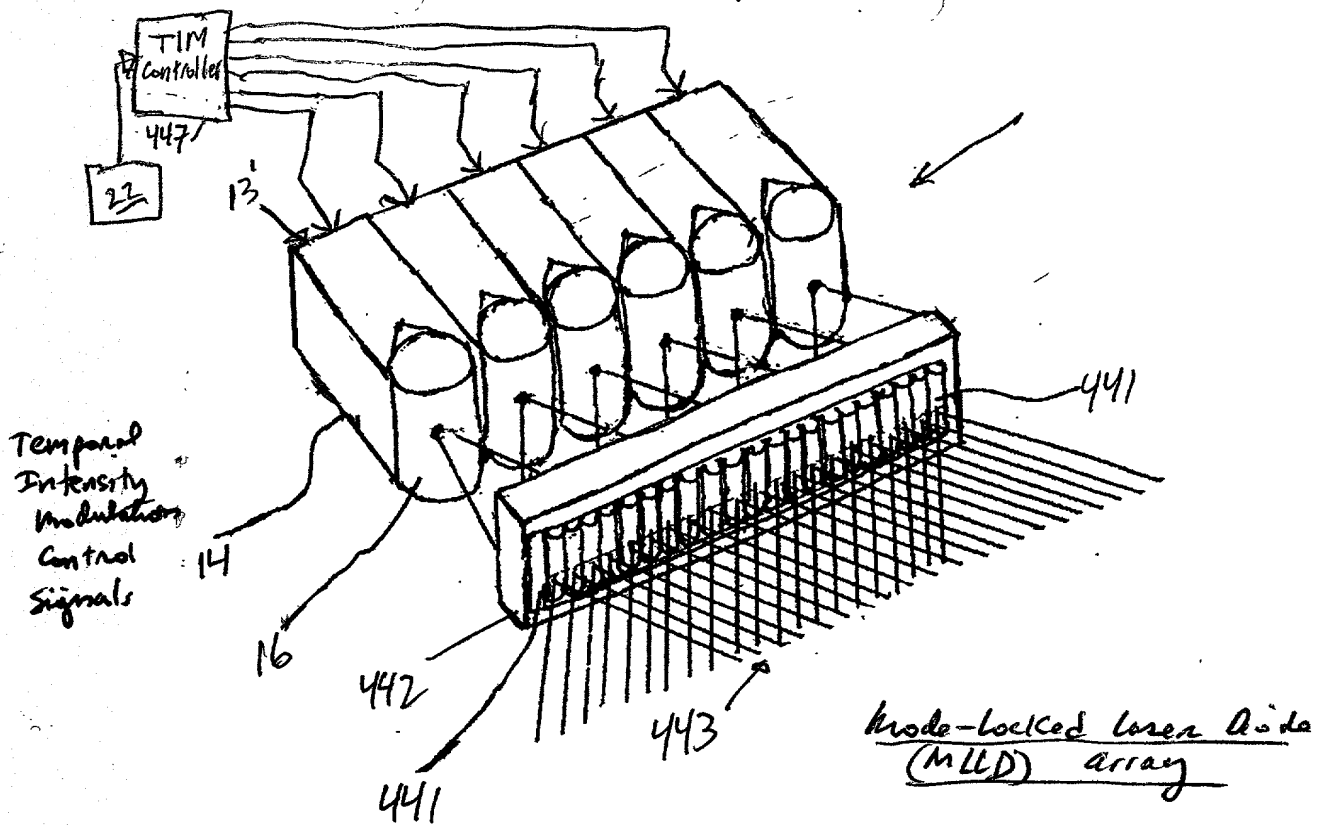
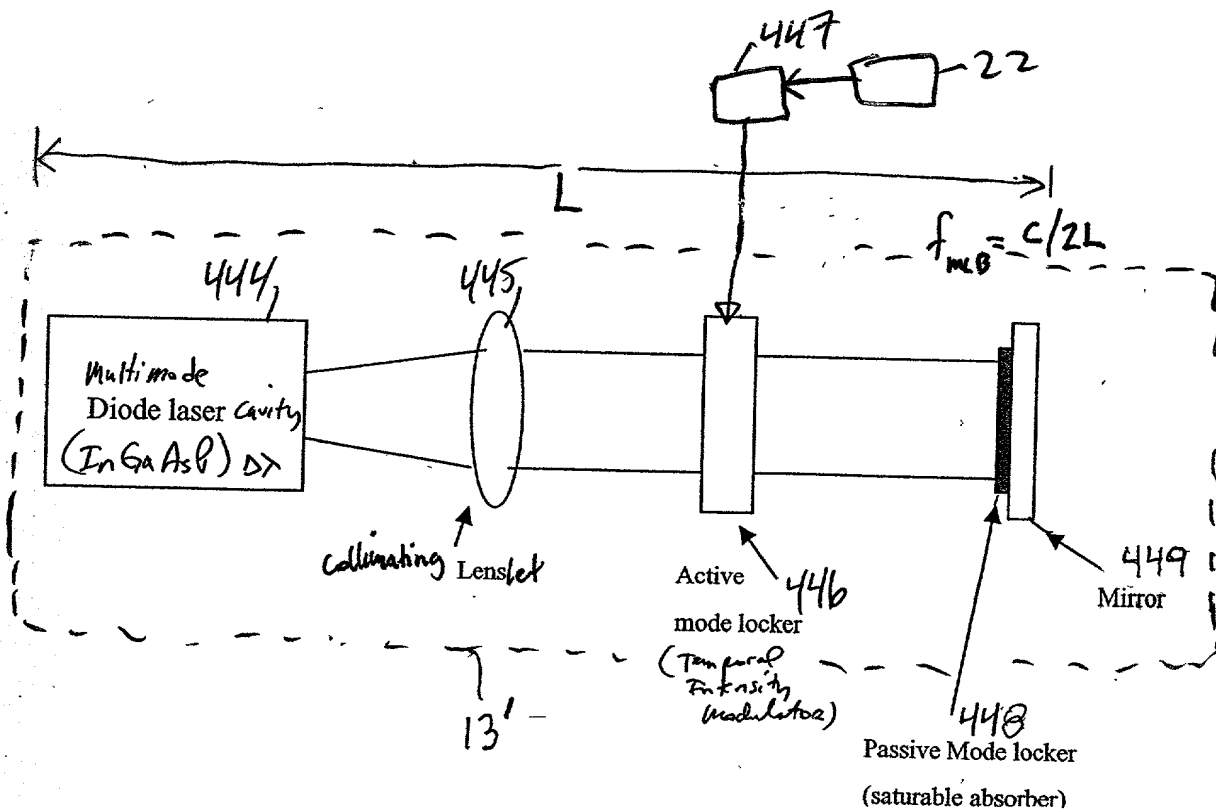
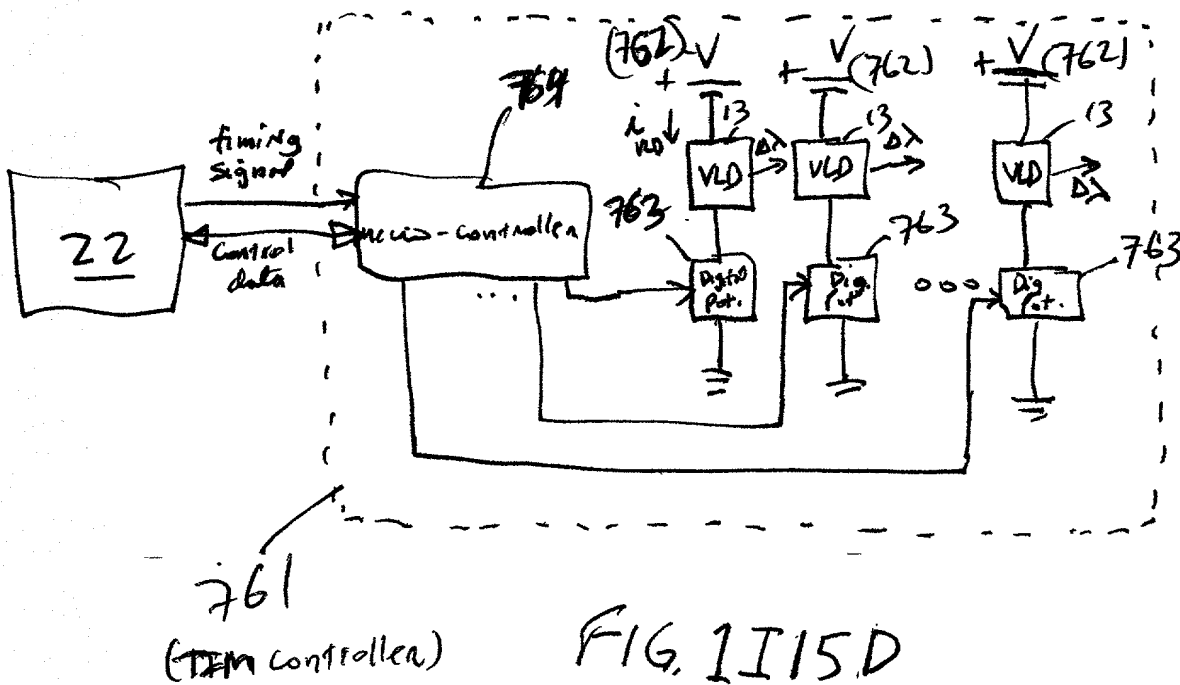
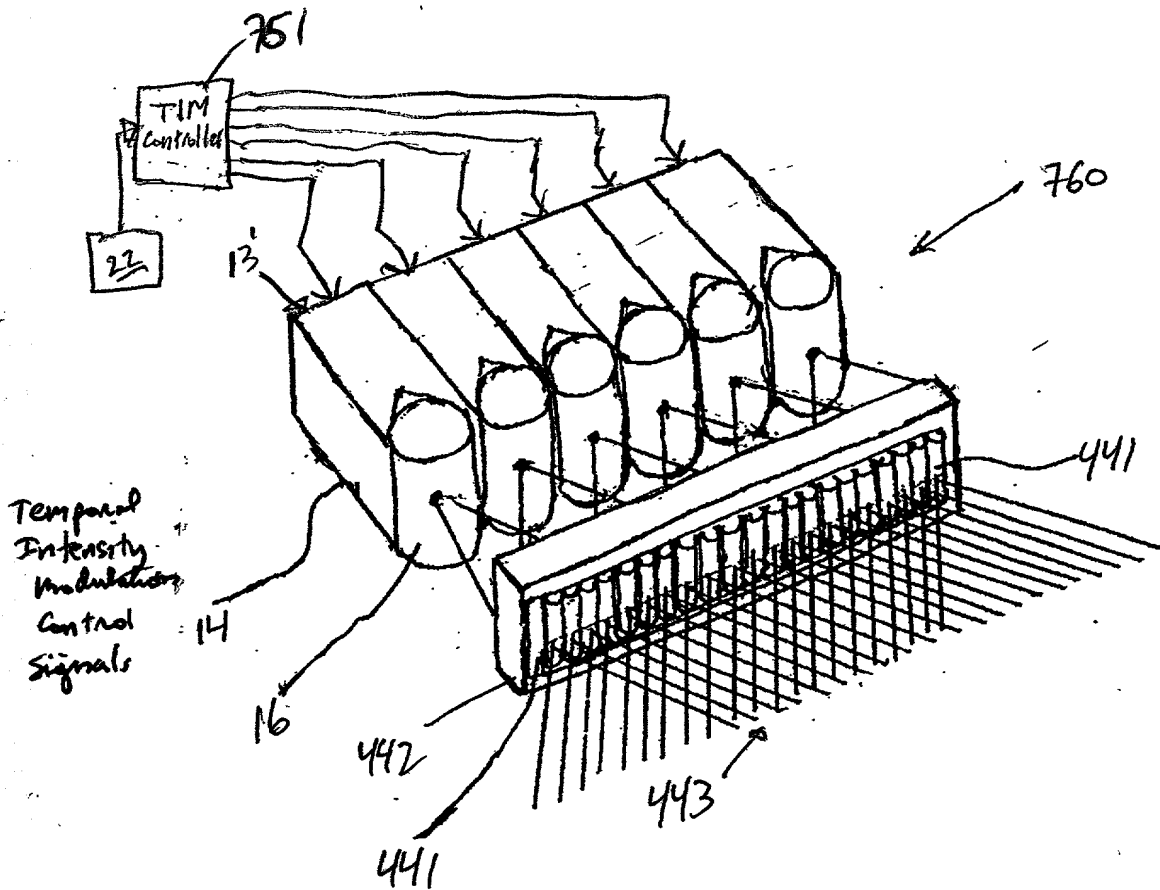


FIG. 1I15A





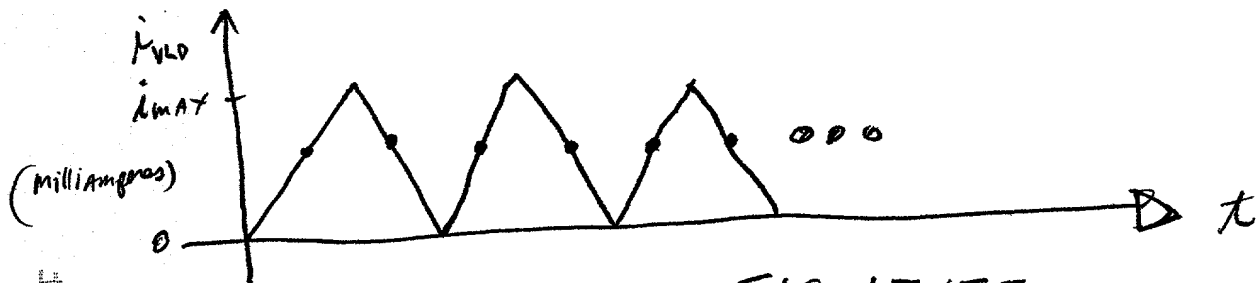


FIG. 1I15E

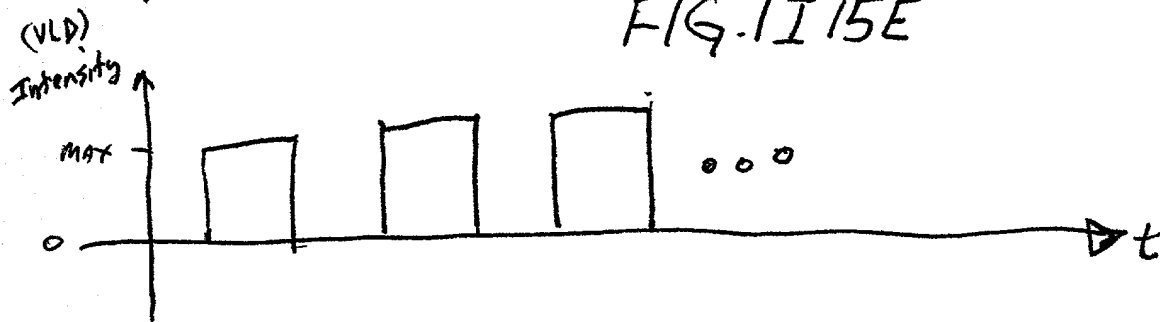


FIG. 1I15F

Third Generalized Method of  
Reducing Speckle-Noise Patterns  
at Image Detection Array  
of the FFD Subsystem (3)

(TIME)

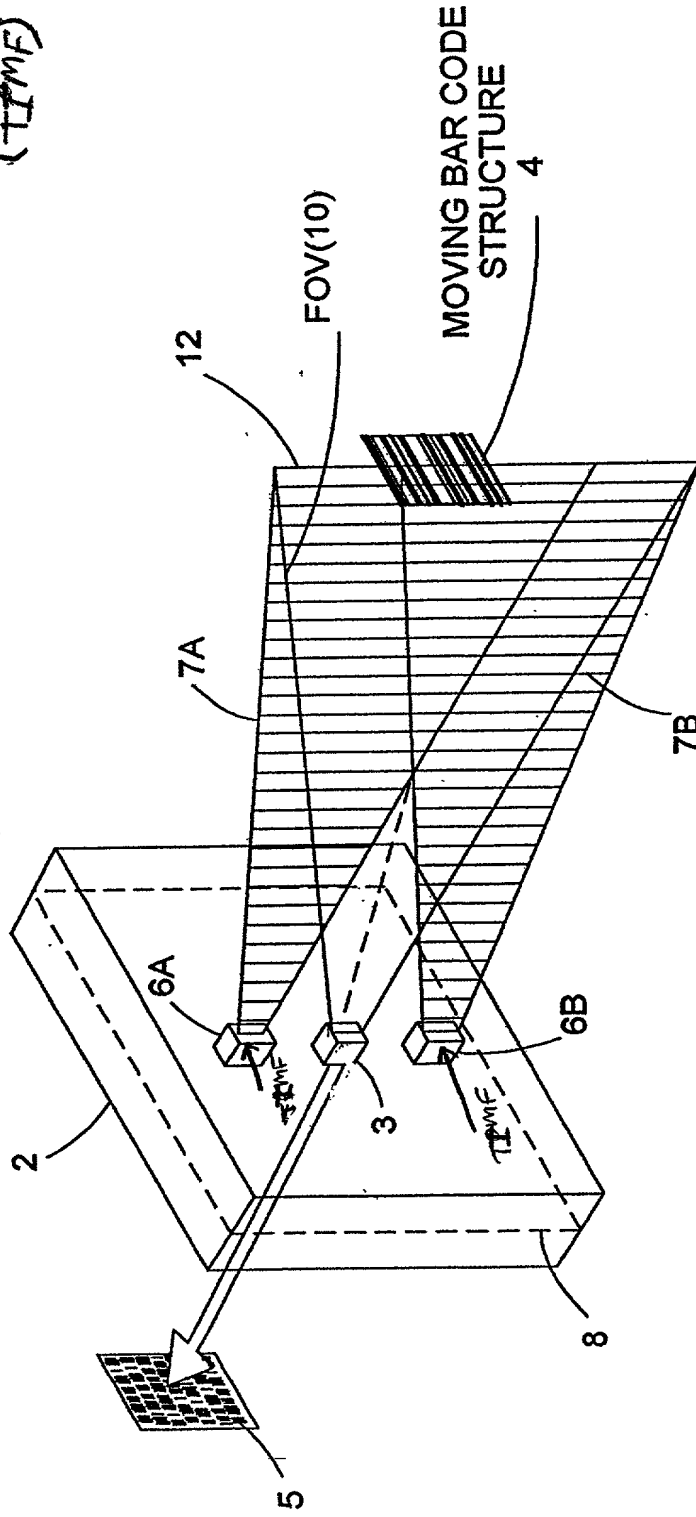


FIG. 11 16

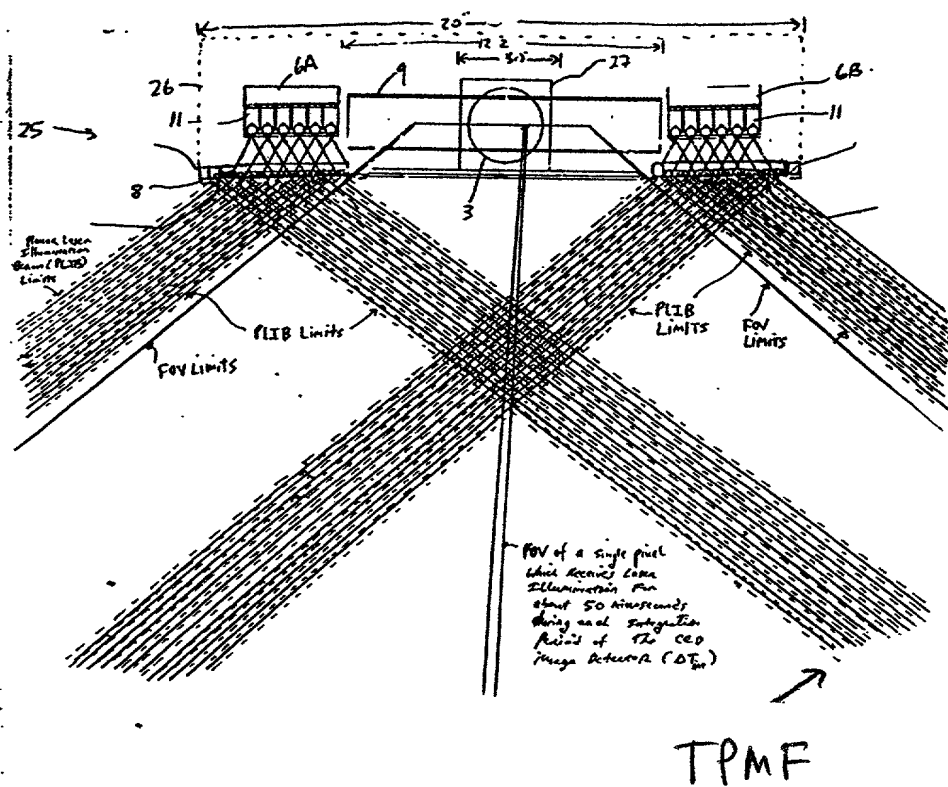


FIG. 1 I 16A

Third Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal *phase* of the transmitted PLIB along the ~~planar extent thereof~~ according to a *Temporal phase* modulation function (TFMF) so as to:

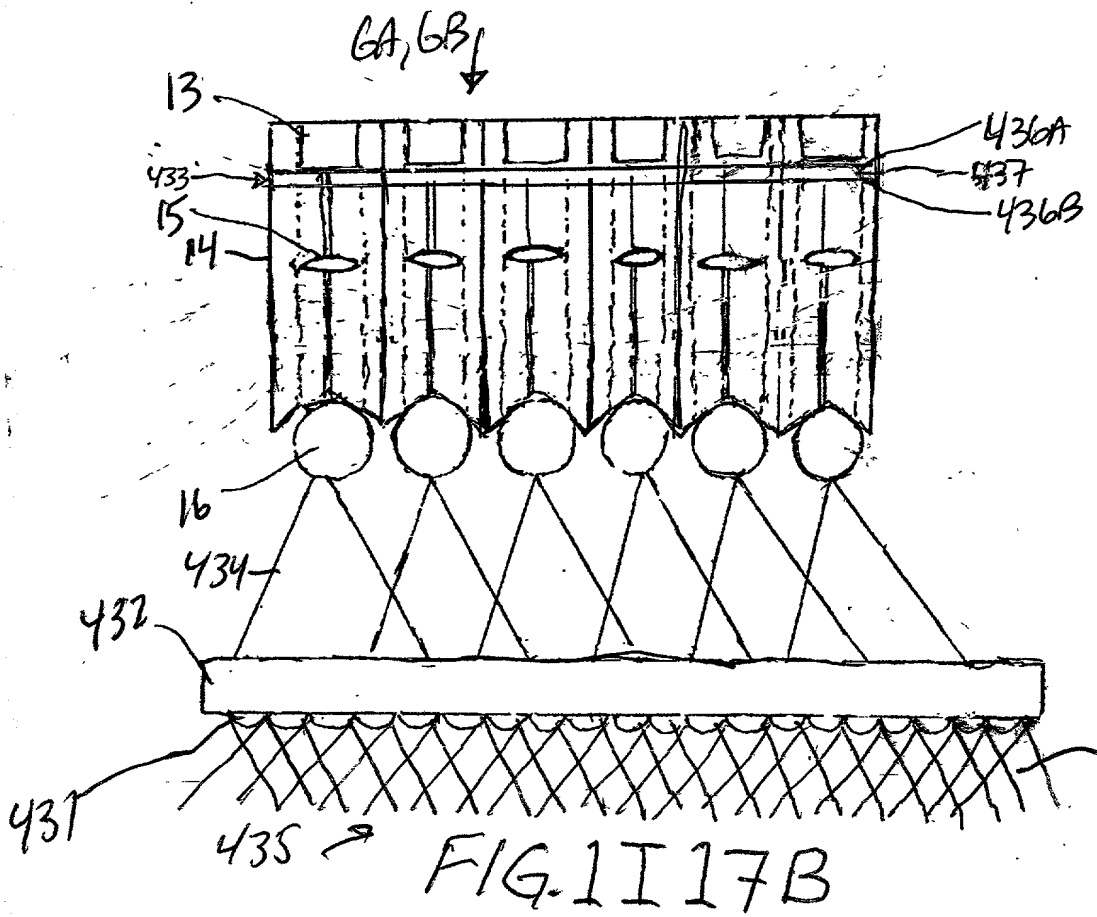
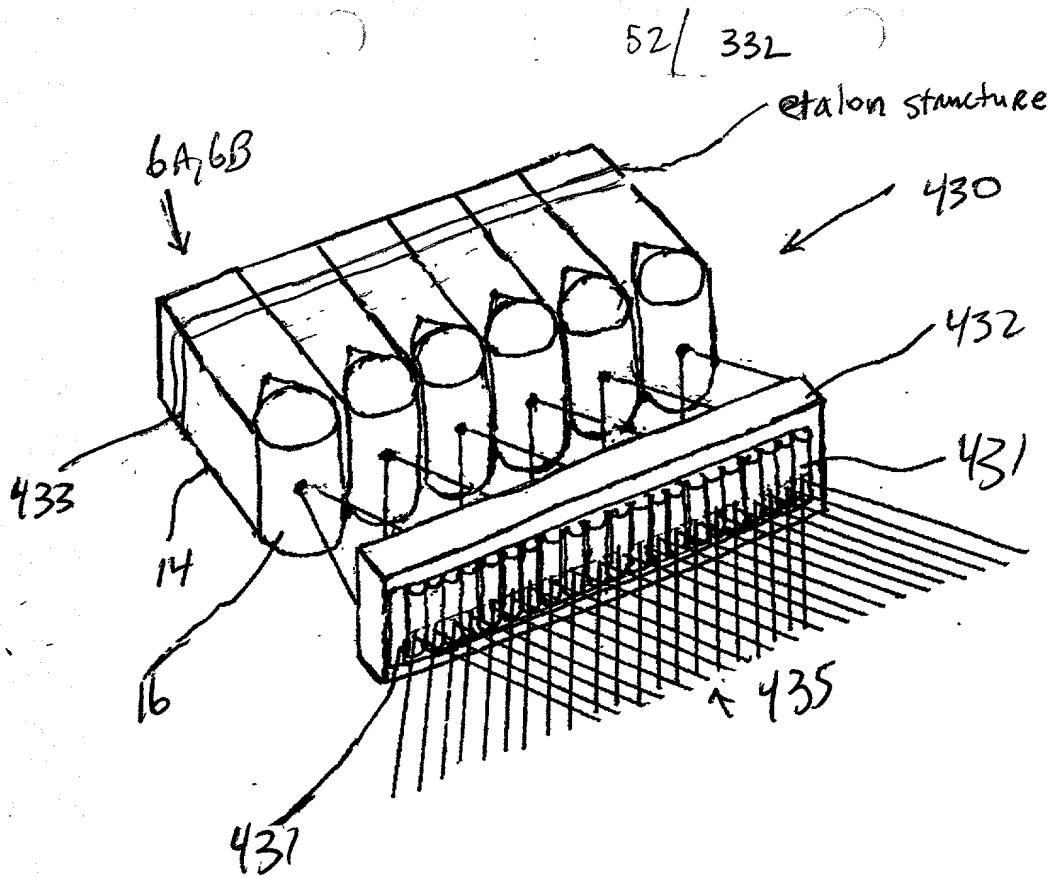
produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

↓

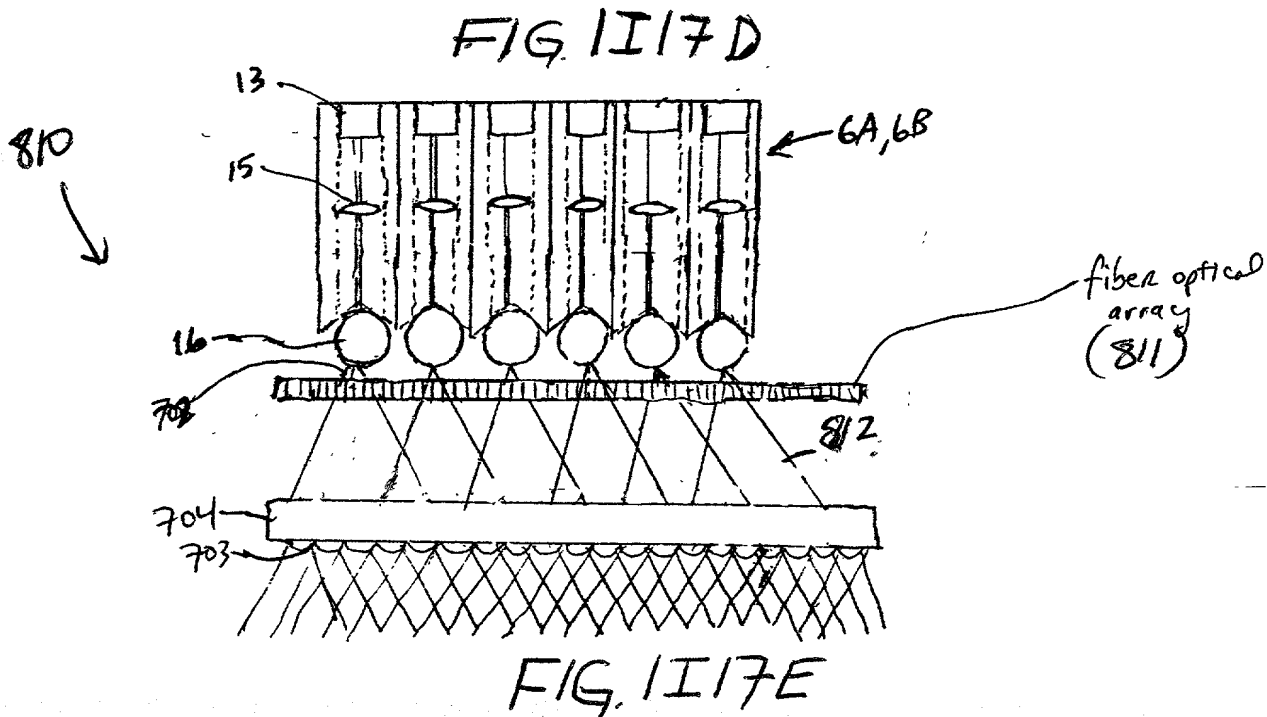
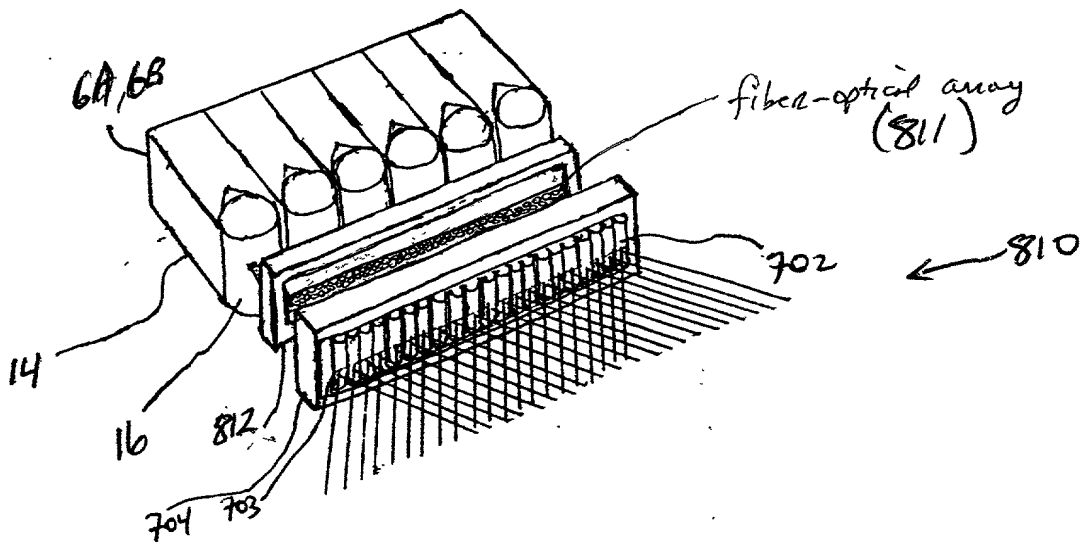
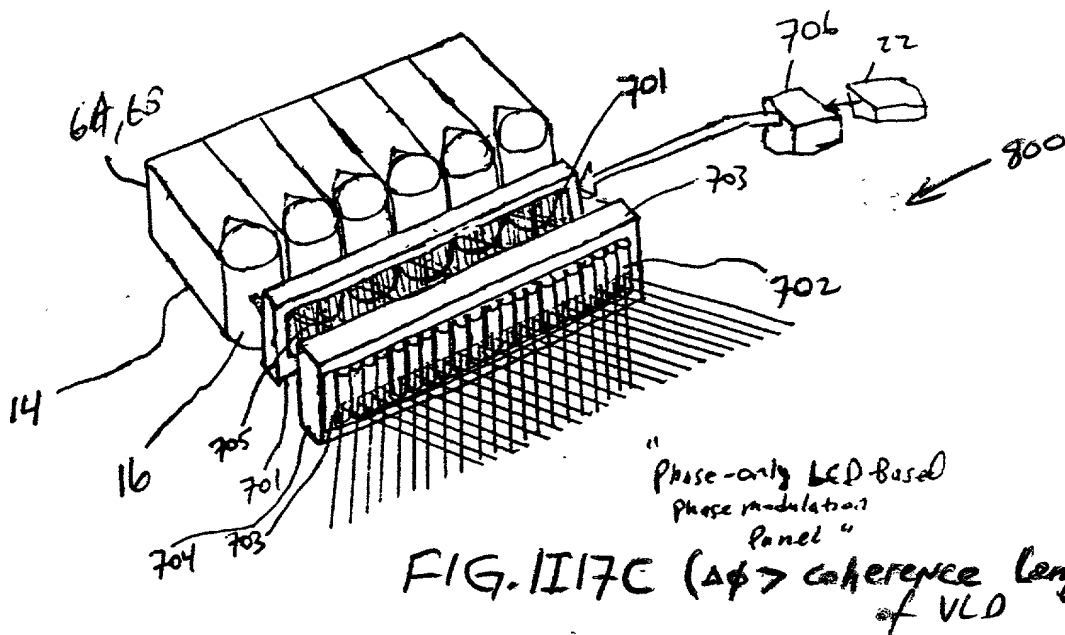
Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I/6B

100688803-020600









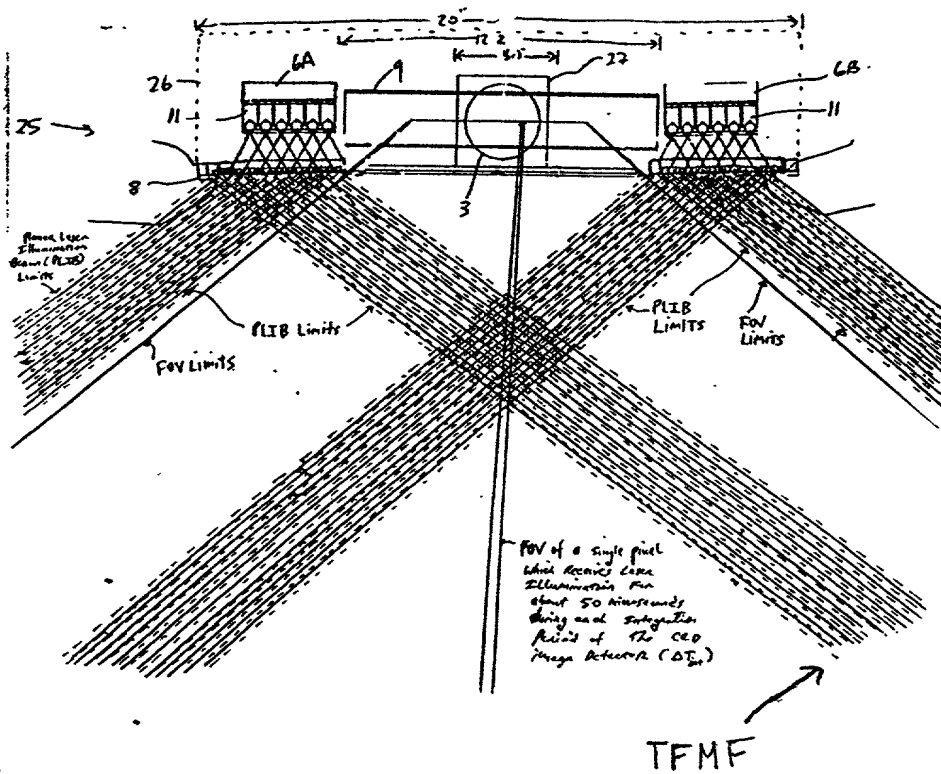


FIG. 1 I 18A

Fourth Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal frequency of the transmitted PLIB according to a temporal intensity modulation function (T IMF) so as to ;

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I18B

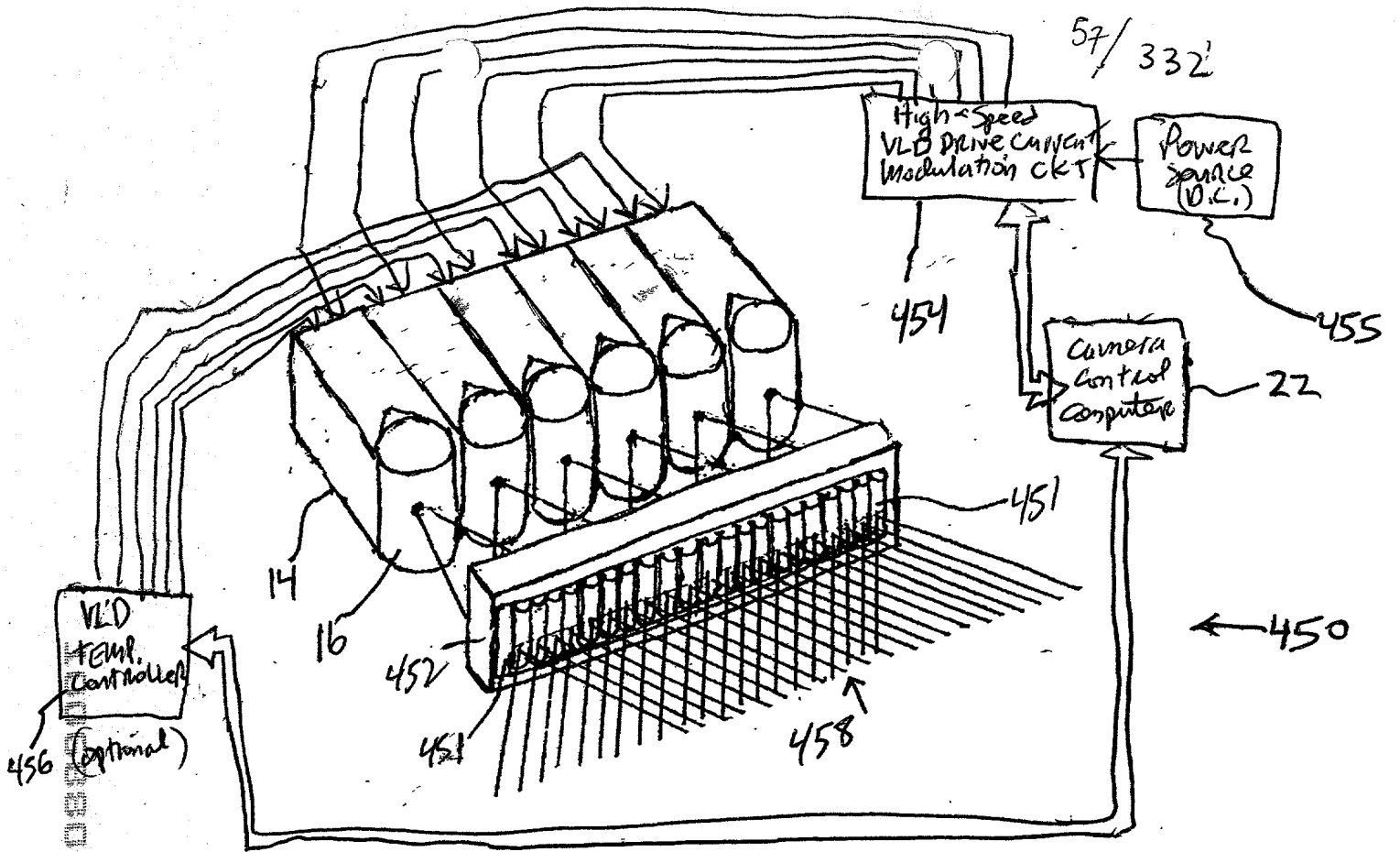


FIG. 1I 19A

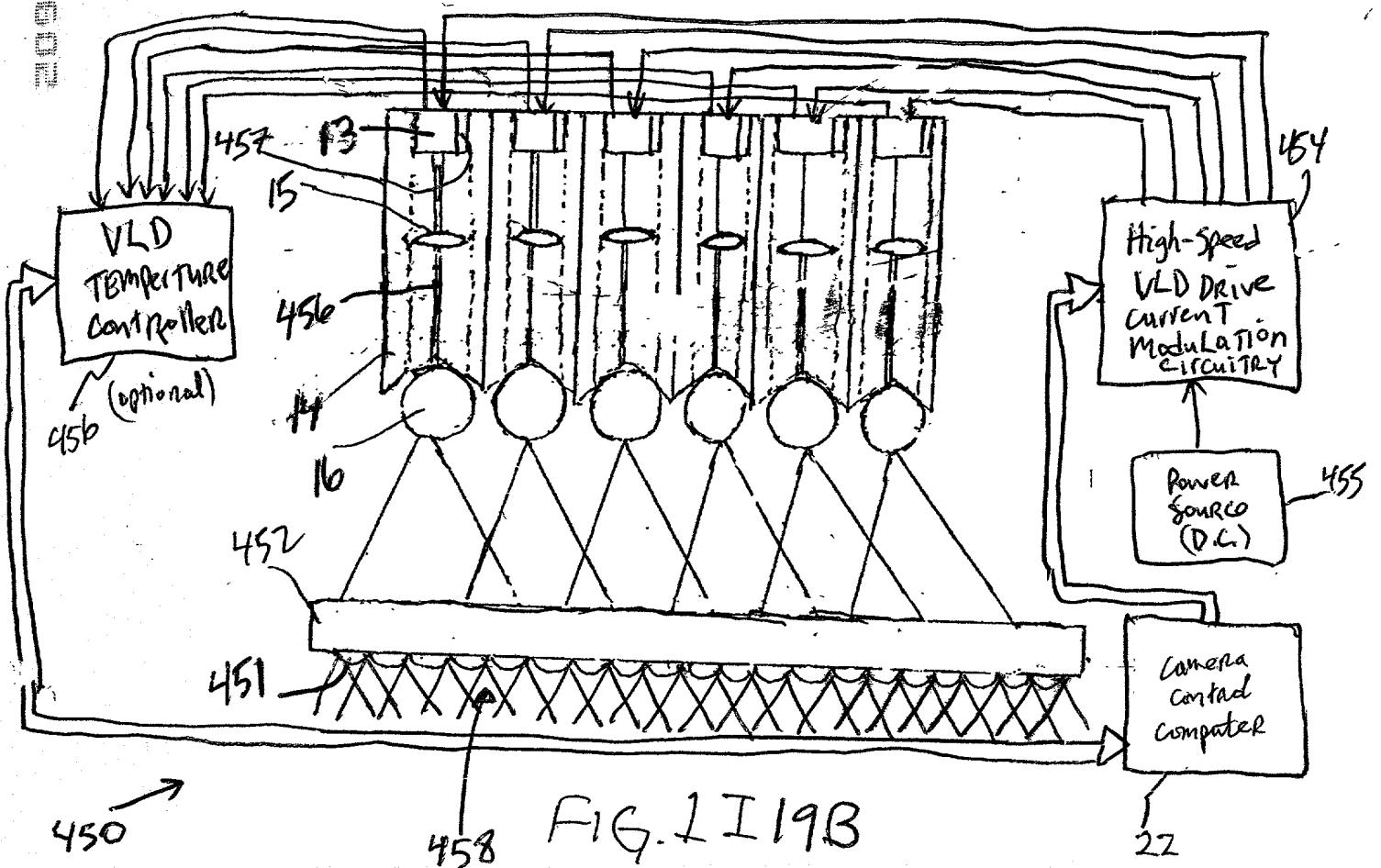
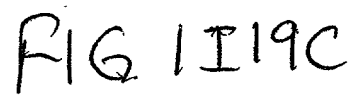


FIG. 1I 19B

*[Faint, illegible vertical text or markings]*



Fifth GENERALIZED METHOD  
of Reducing Speckle-Noise  
PATTERNS AT IMAGE  
DETECTION array OF the  
FFD subsystem (3)

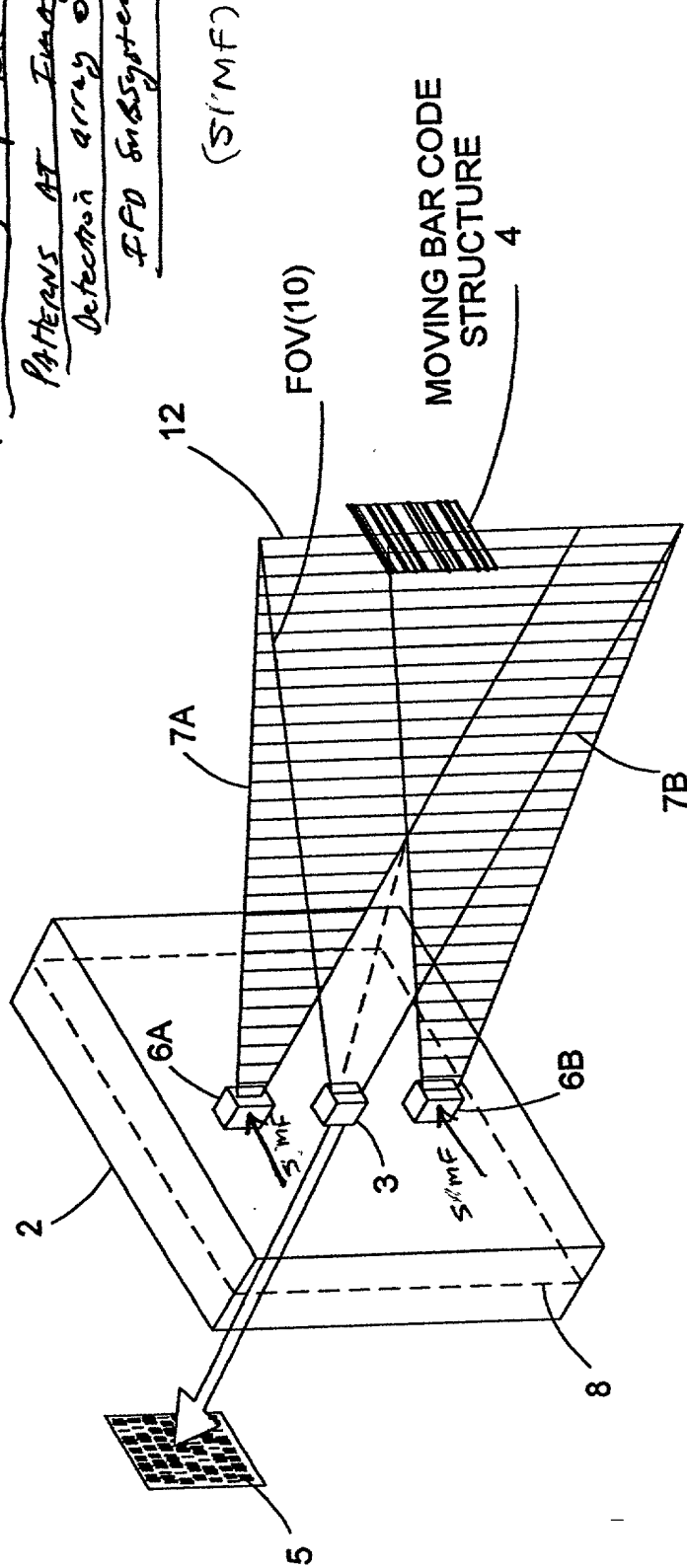


FIG. 20

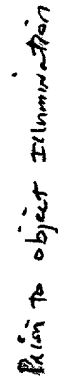


FIG. 1 I ZOA



Fifth Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the transmitted PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

↓

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I20B

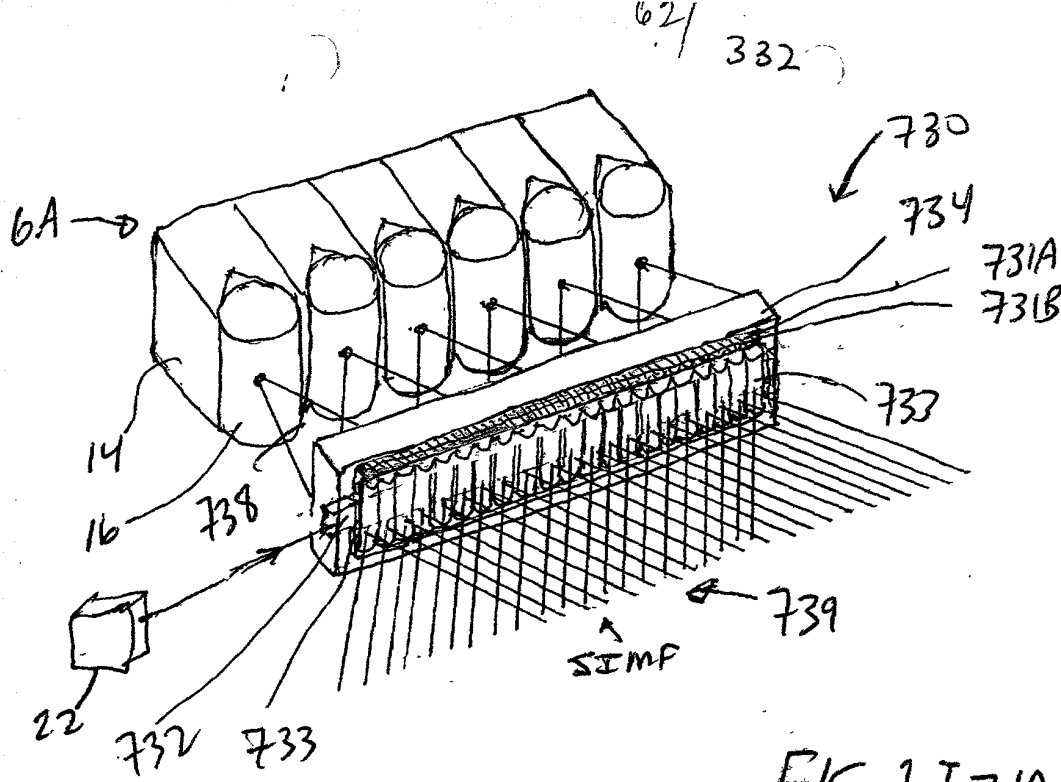


FIG. 1I2IA

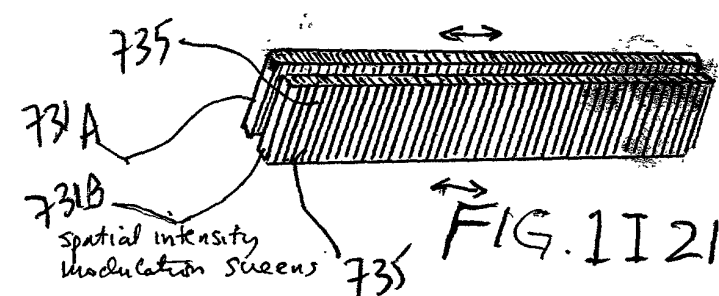


FIG. 1I2IB



FIG. 1I2IC

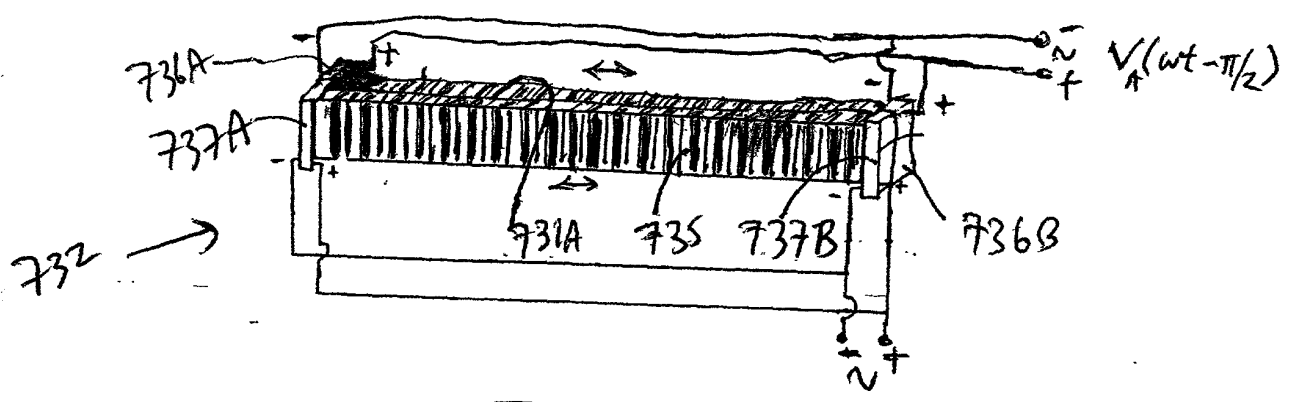


FIG. 1I2ID

200908-EOB89001

Generalized Method of  
Reducing Speckle-Noise Patterns  
at Image Detection array  
of the IFD Subsystem

(SIMF)

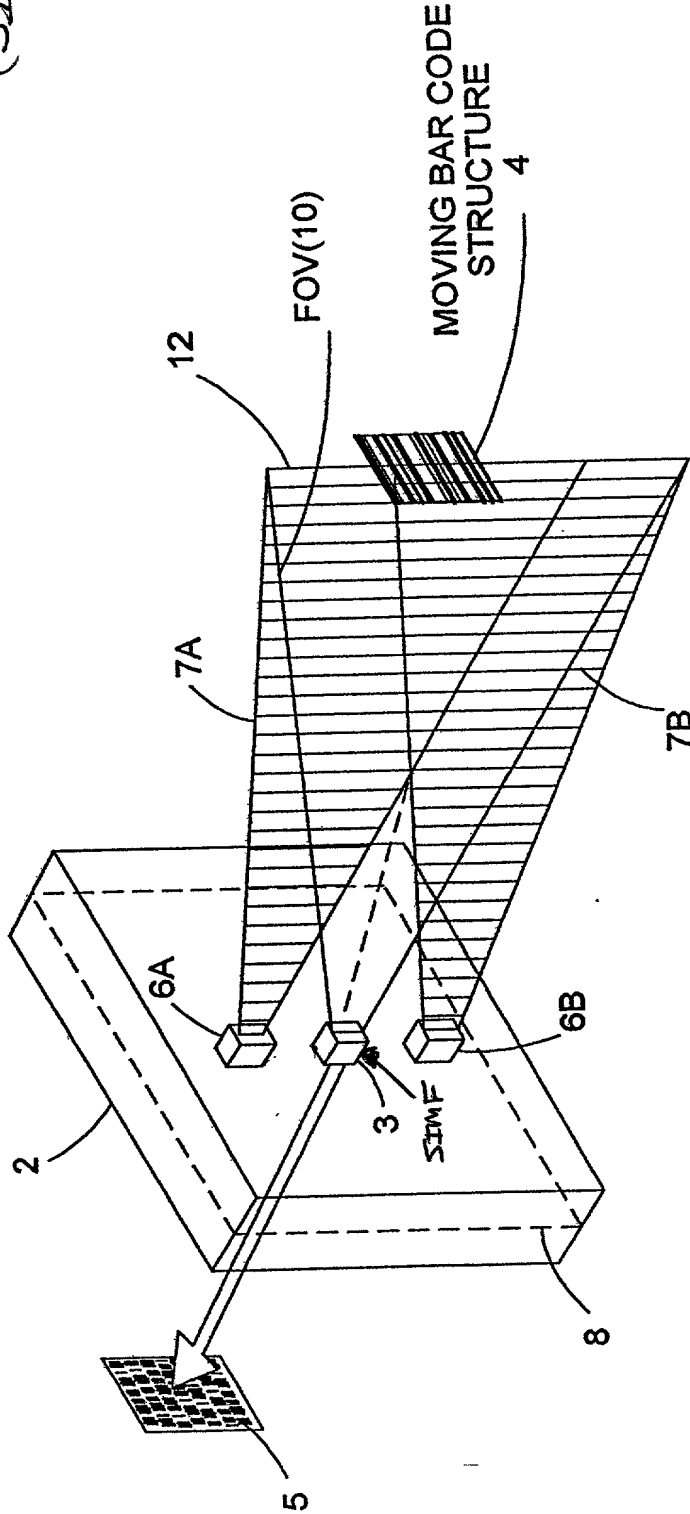


FIG. 11 22

64/ 332

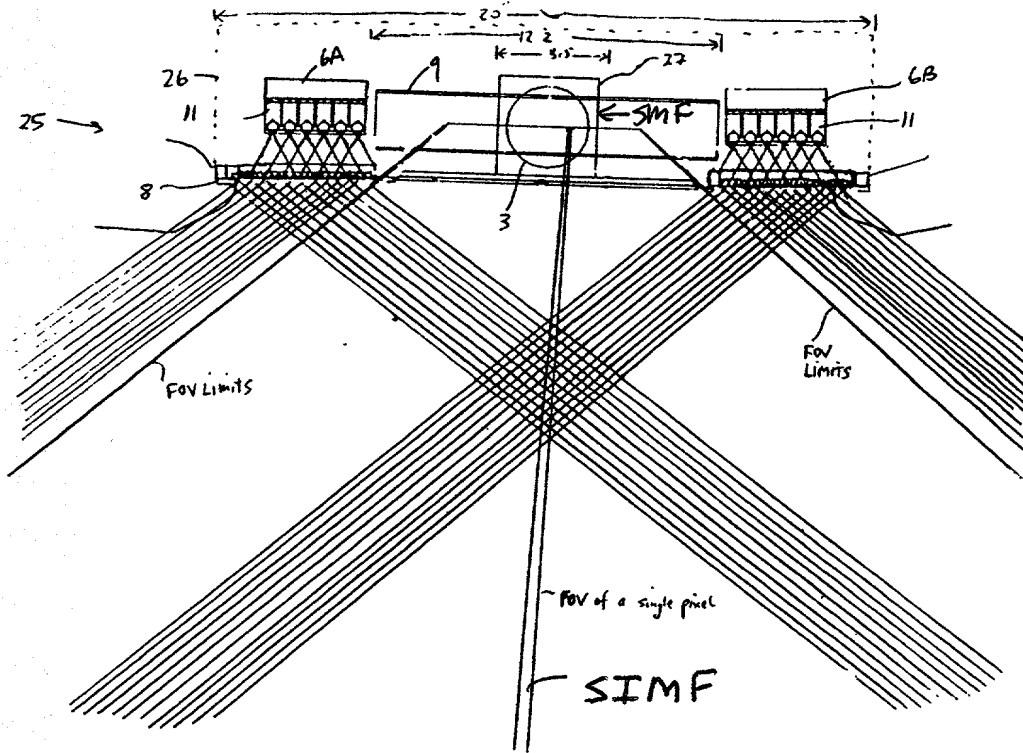


FIG. 1I 22A

Sixth Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to :

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I 22B

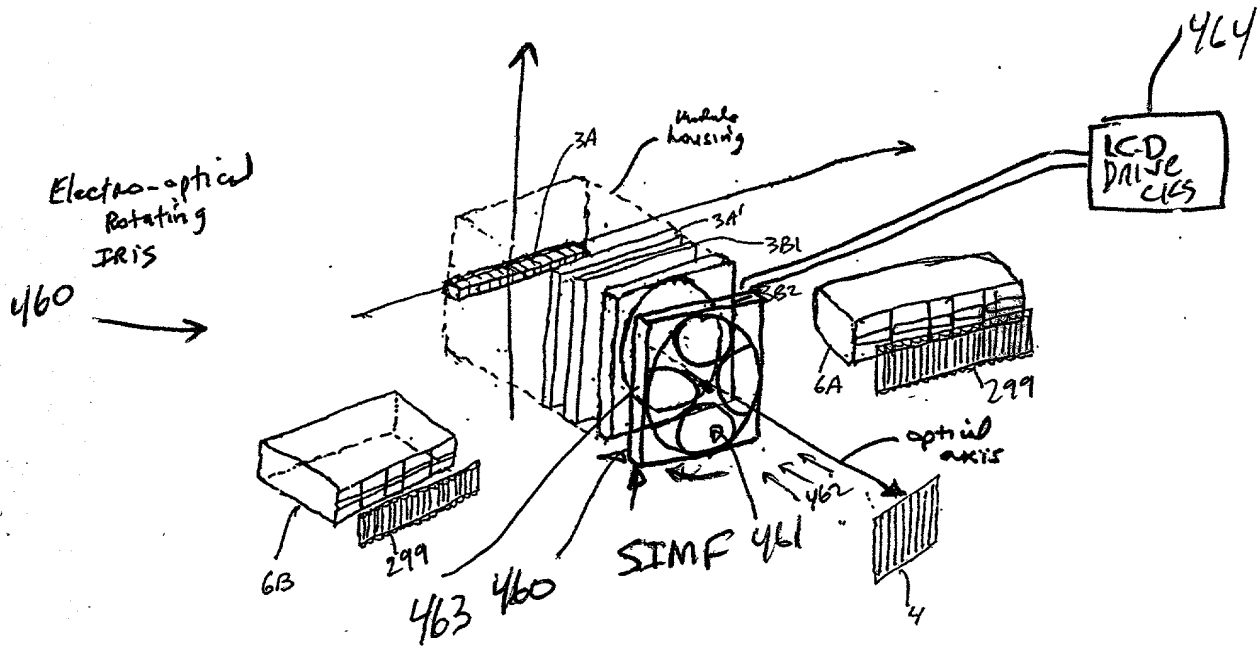


FIG. 1I 23A

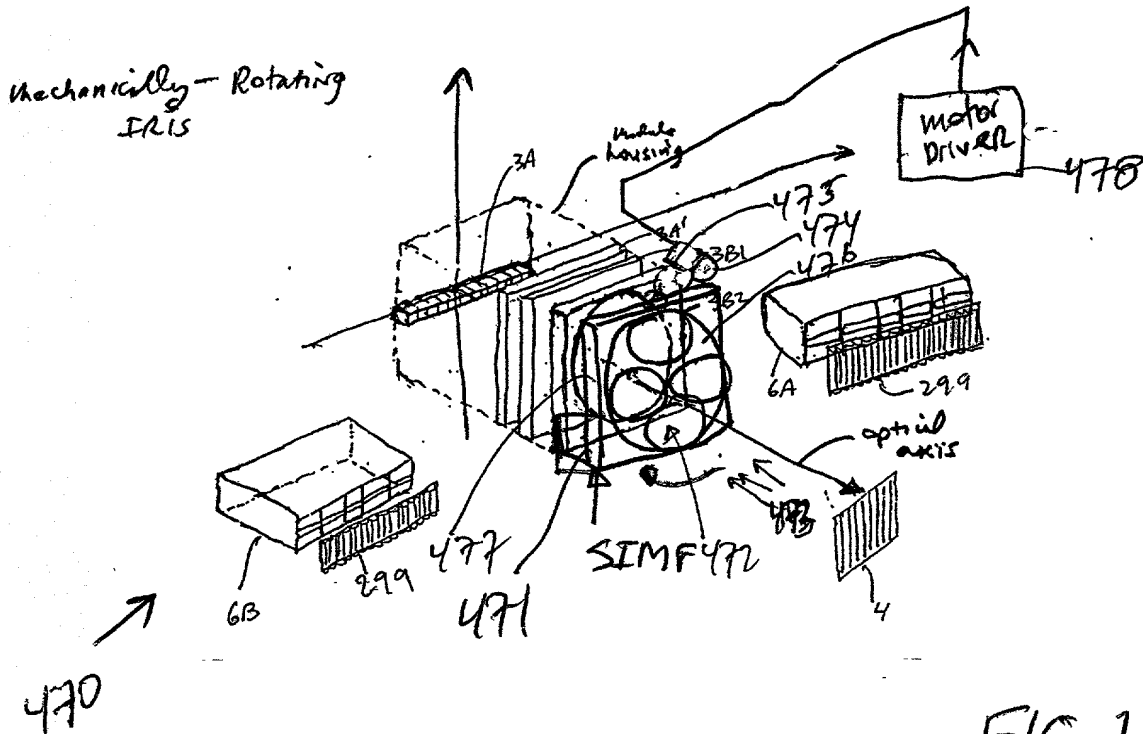


FIG. 1I 23B

Seventh Generalized Method of  
Reducing Speckle - Noise Patterns  
at Image Detection Array  
of the IFD Subsystem

(TIMF)

67/ 332

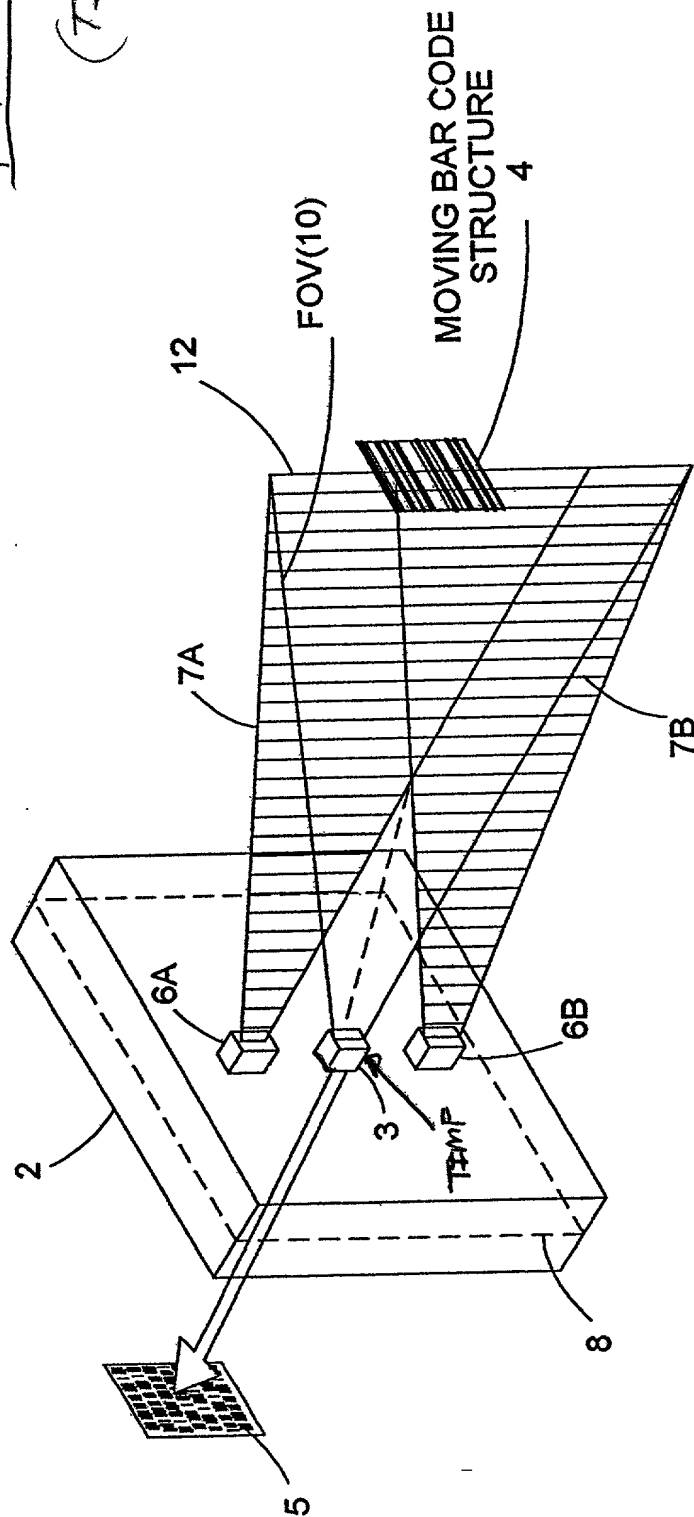


FIG. 1124

680/ 332

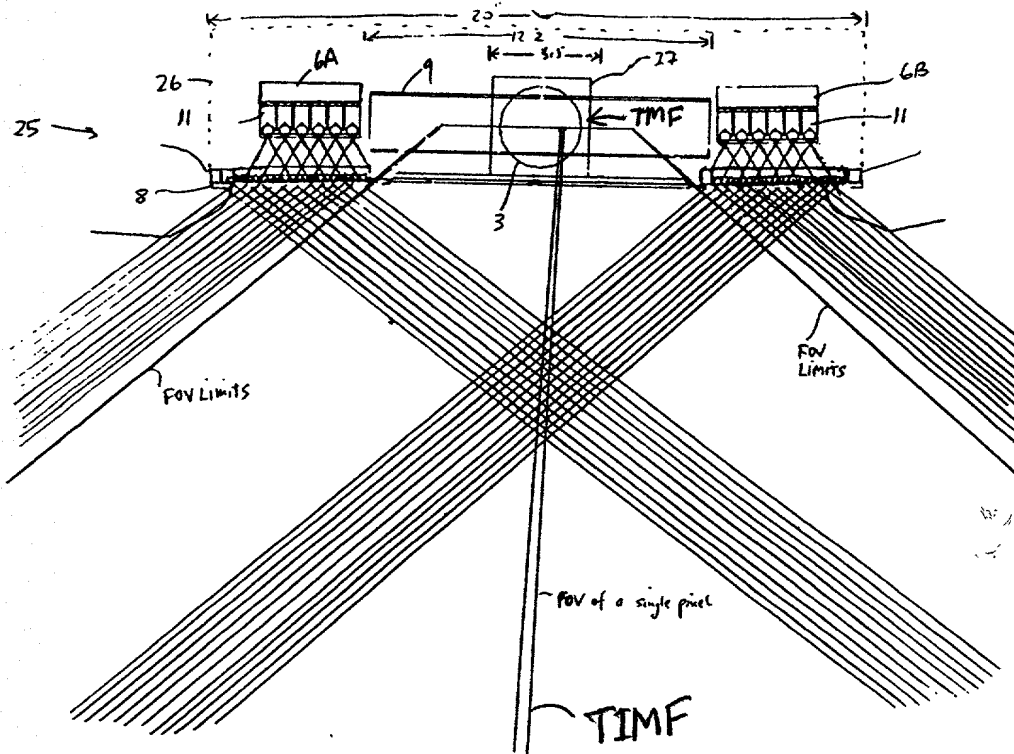


FIG. 1I24A



Seventh Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a temporal intensity modulation function (TIME) so as to

produce many substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I 24B

70/ 332

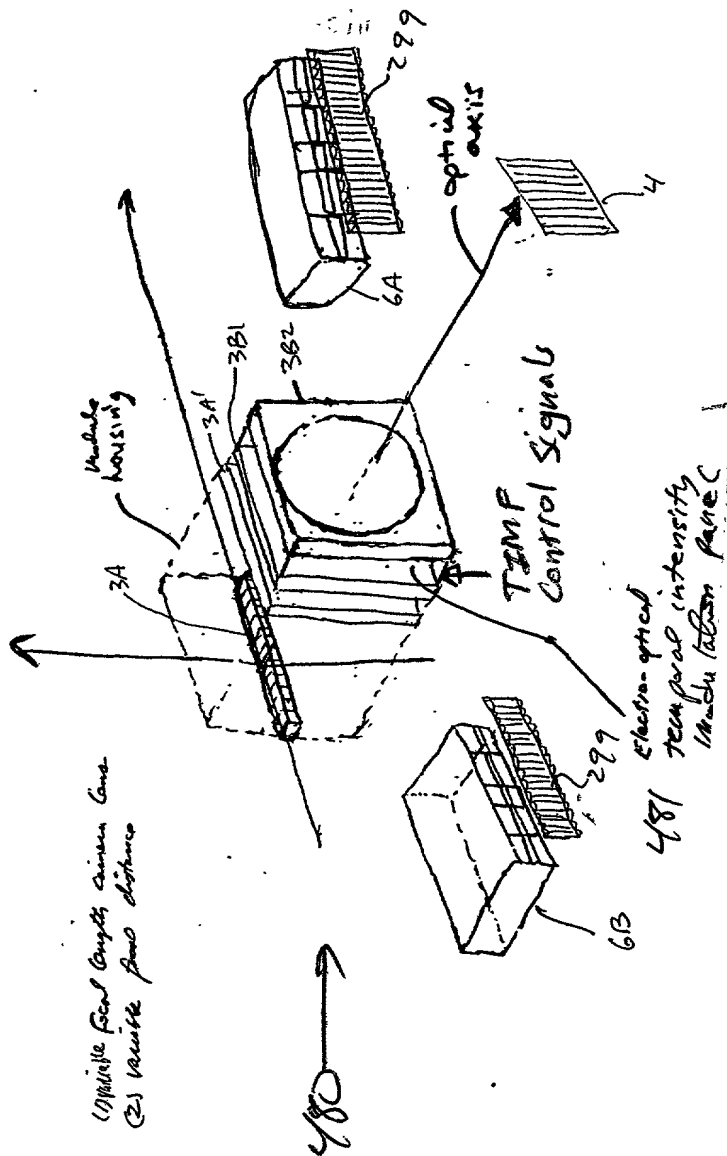
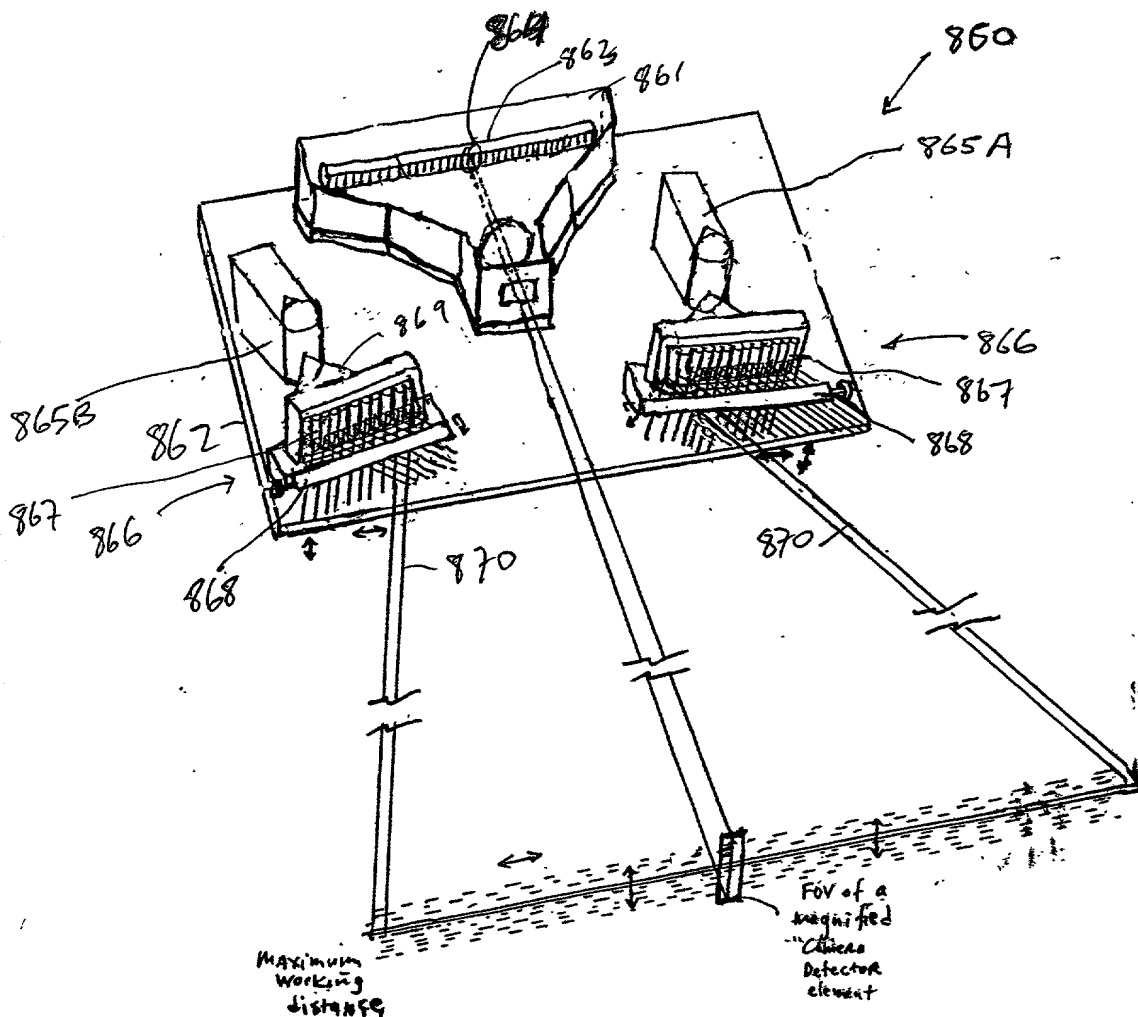


FIG. 1I Z4C

10058803.020602

H/ 332



\* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25A1

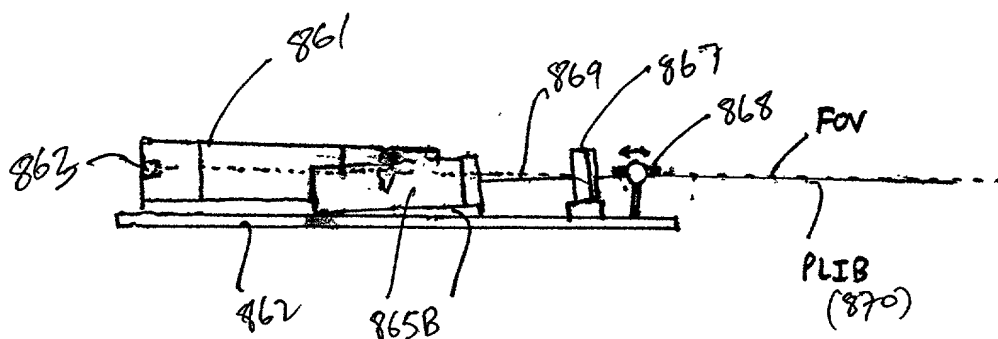


FIG. 1I25A2

10052803-020502

72/ 332

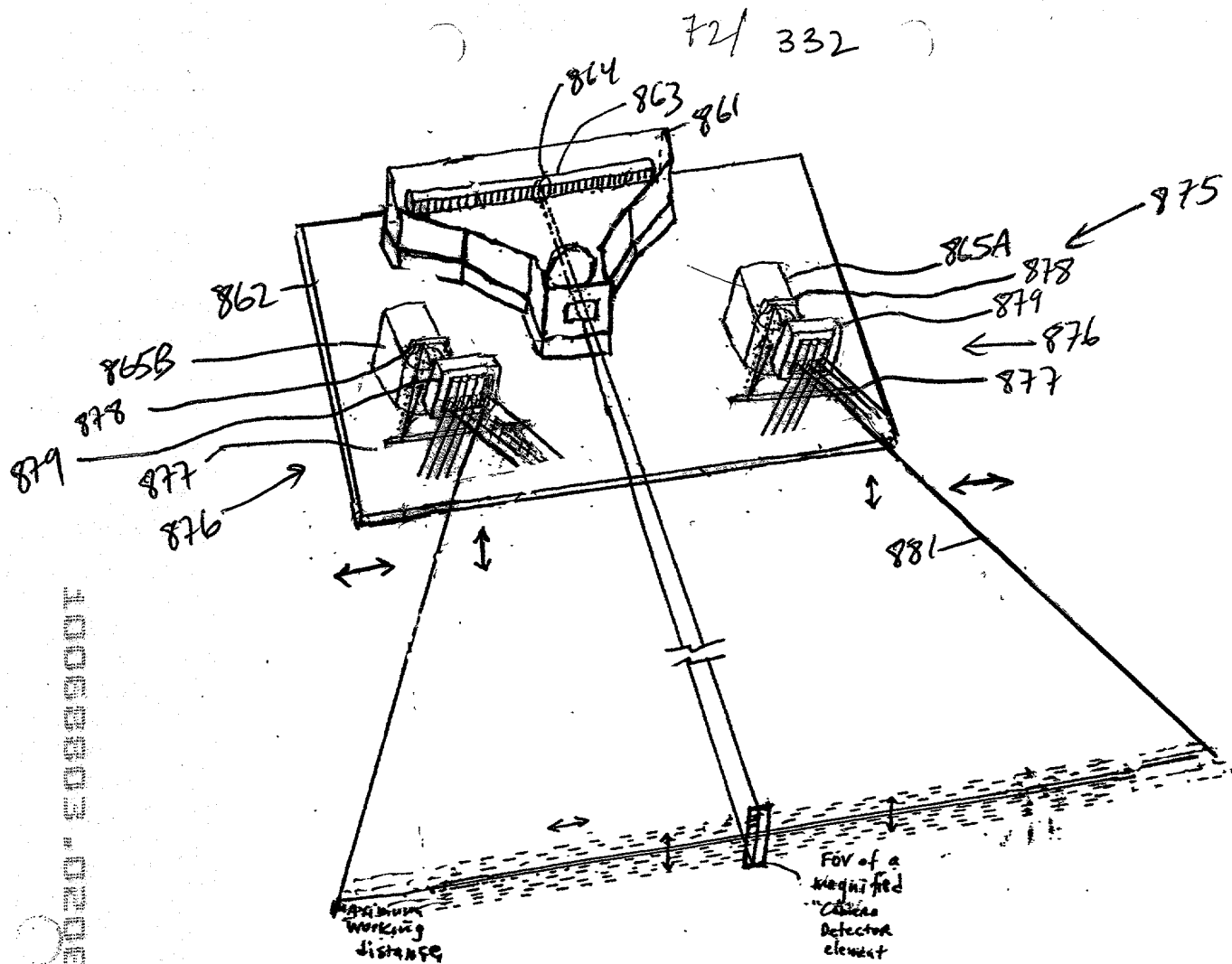


FIG. 1I25B1

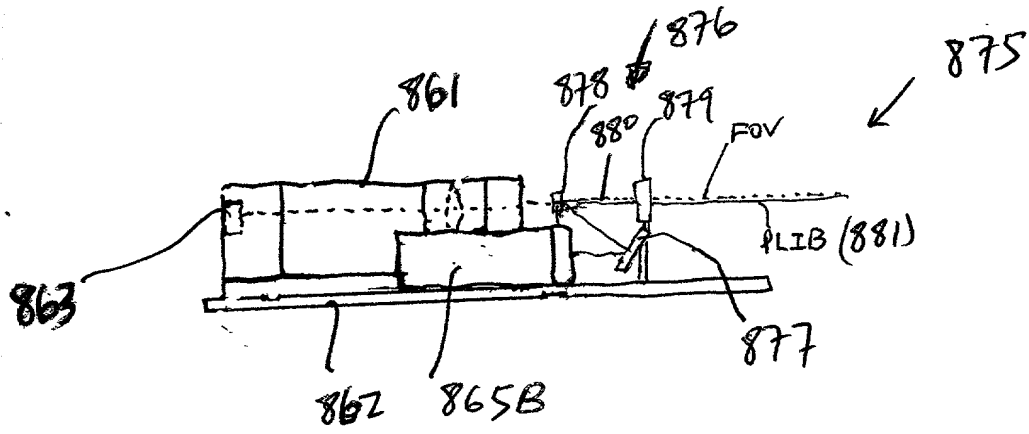


FIG. 1I25B2

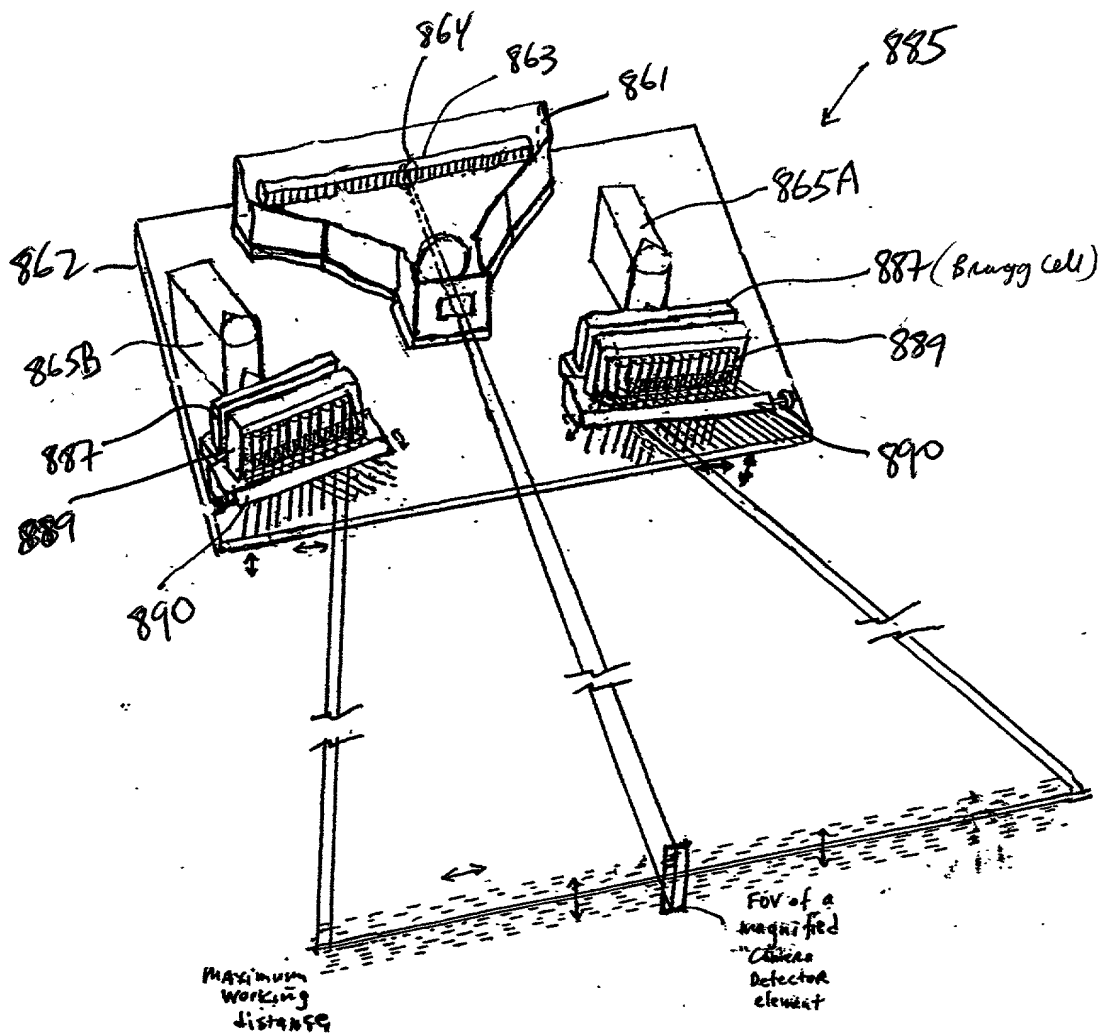


FIG. 1I25C1

\* Lateral and Transverse Microoscillation of PLIB

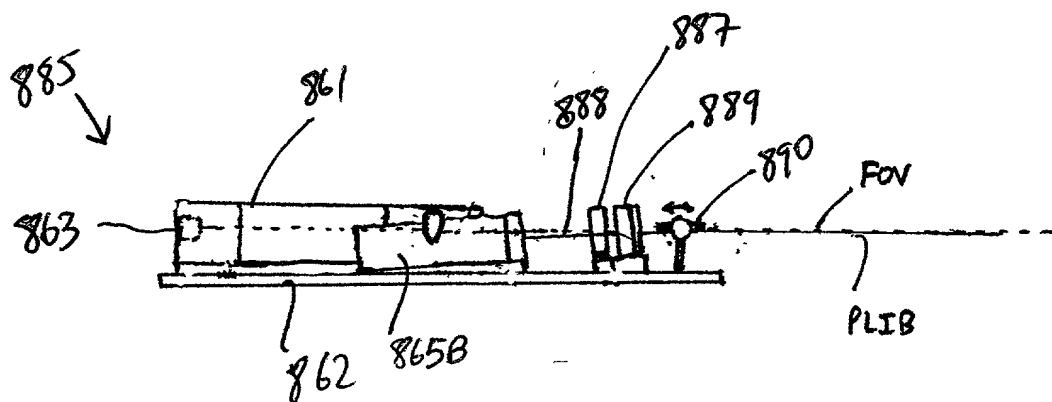


FIG. 1I25C2

209902-009900T

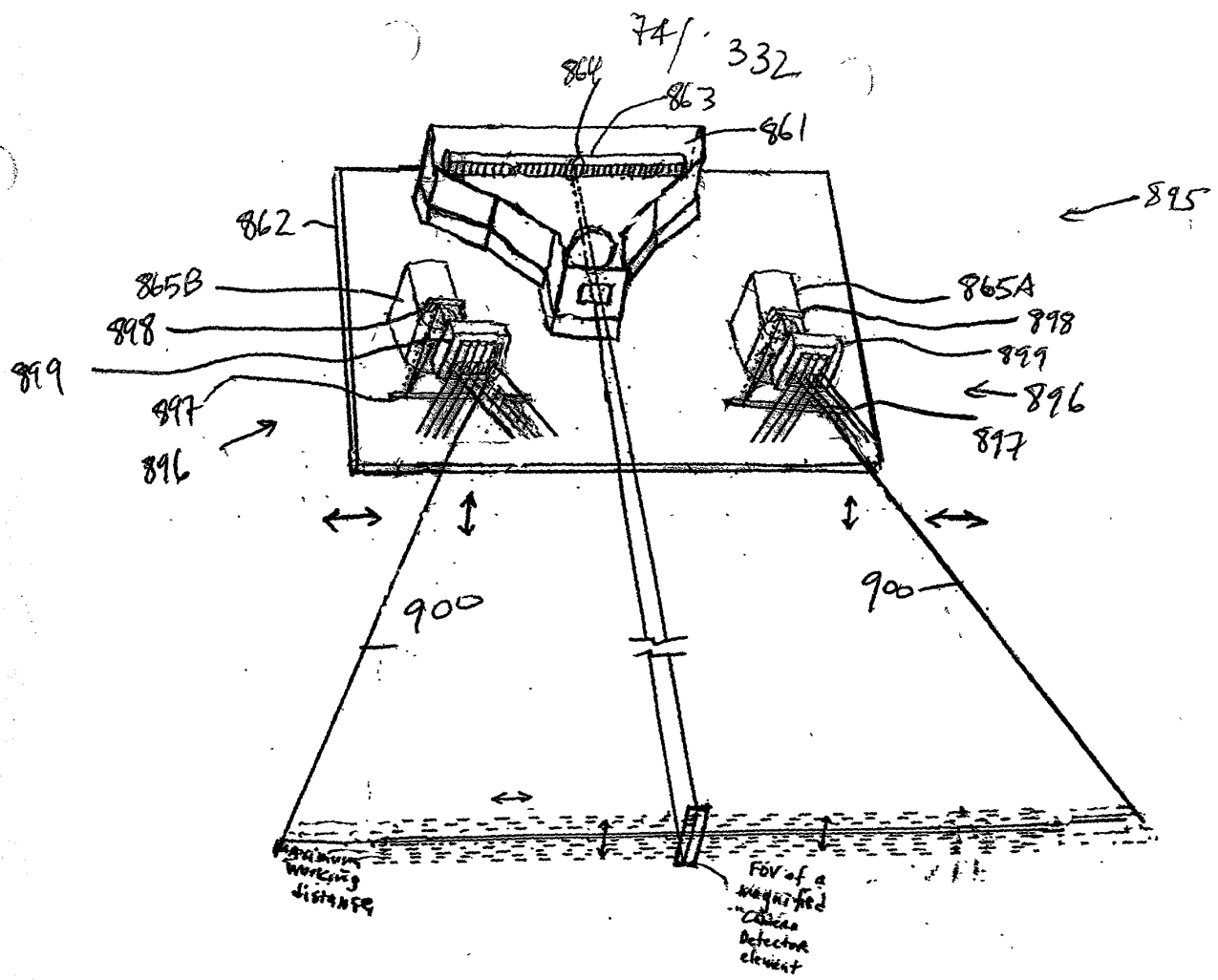


FIG. 1 I 25 D1

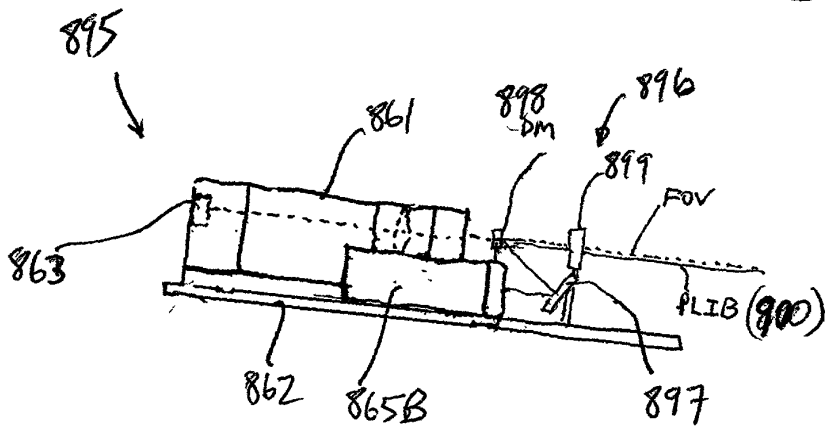


FIG. 1 I 25 D2

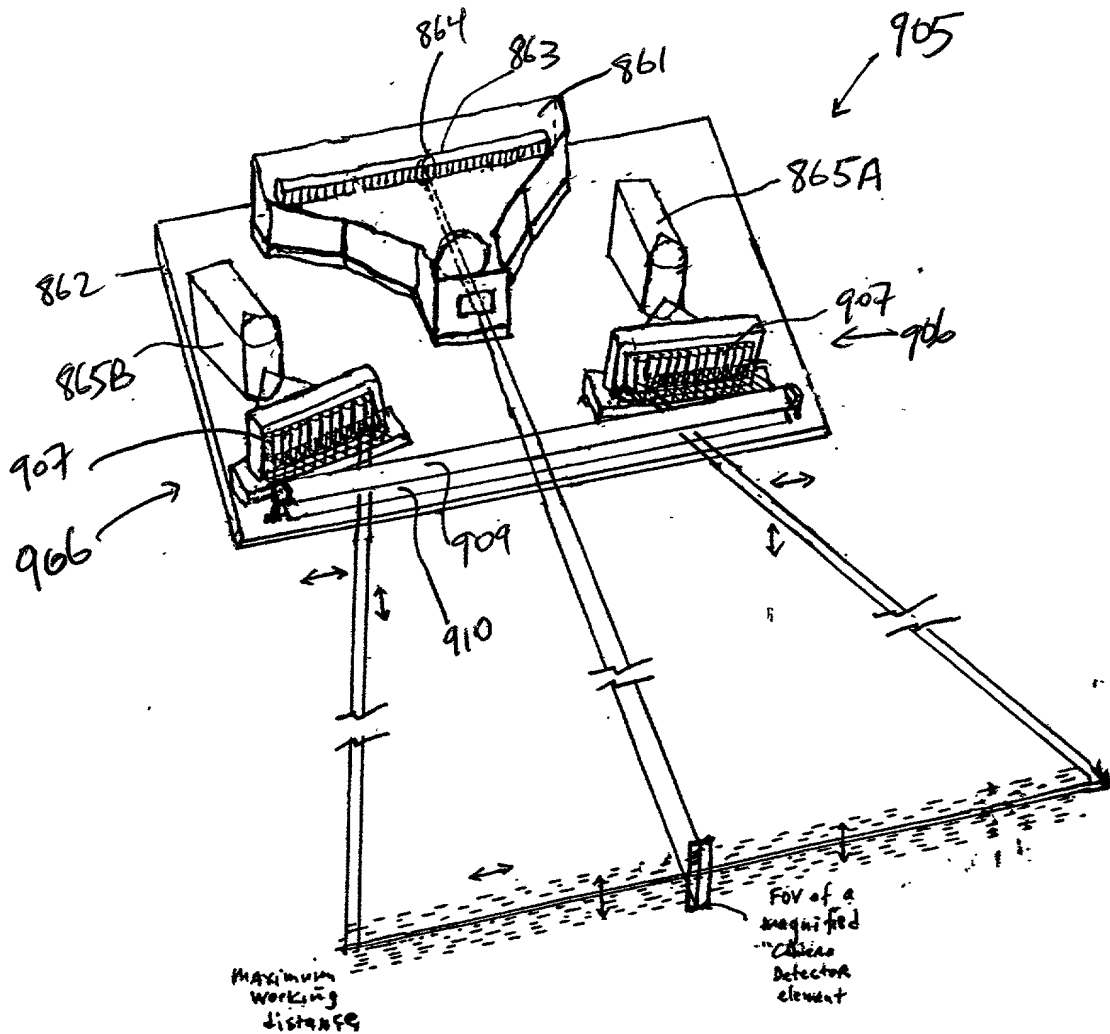


FIG. 1I25E1

\* Lateral and Transverse Microoscillation of PLB

905

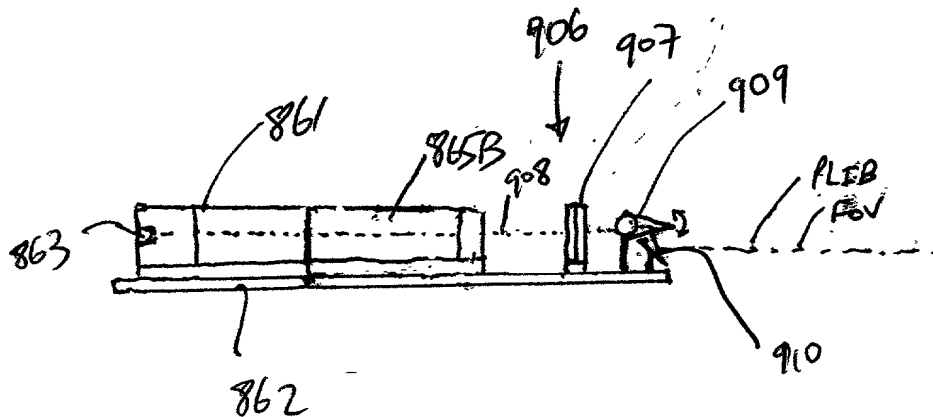
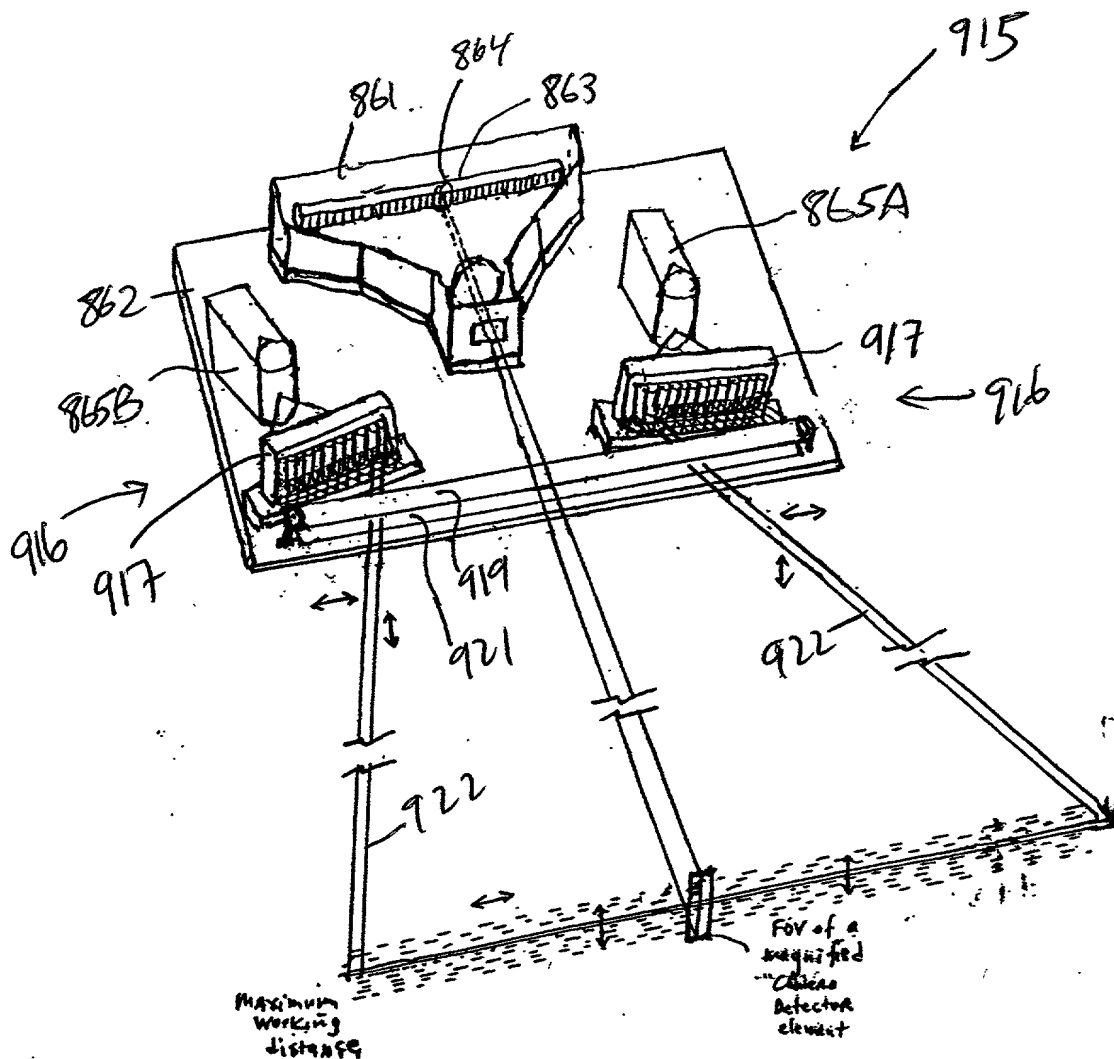


FIG. 1I25E2



\* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25F1

915

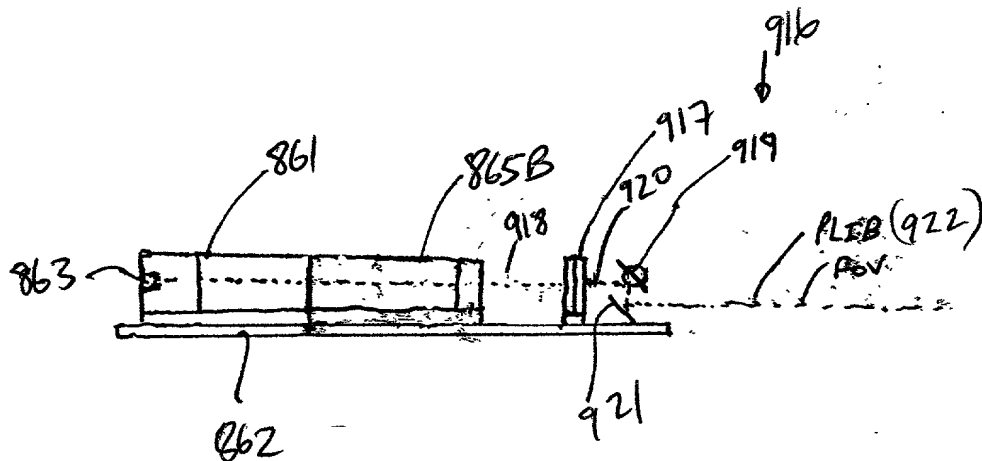
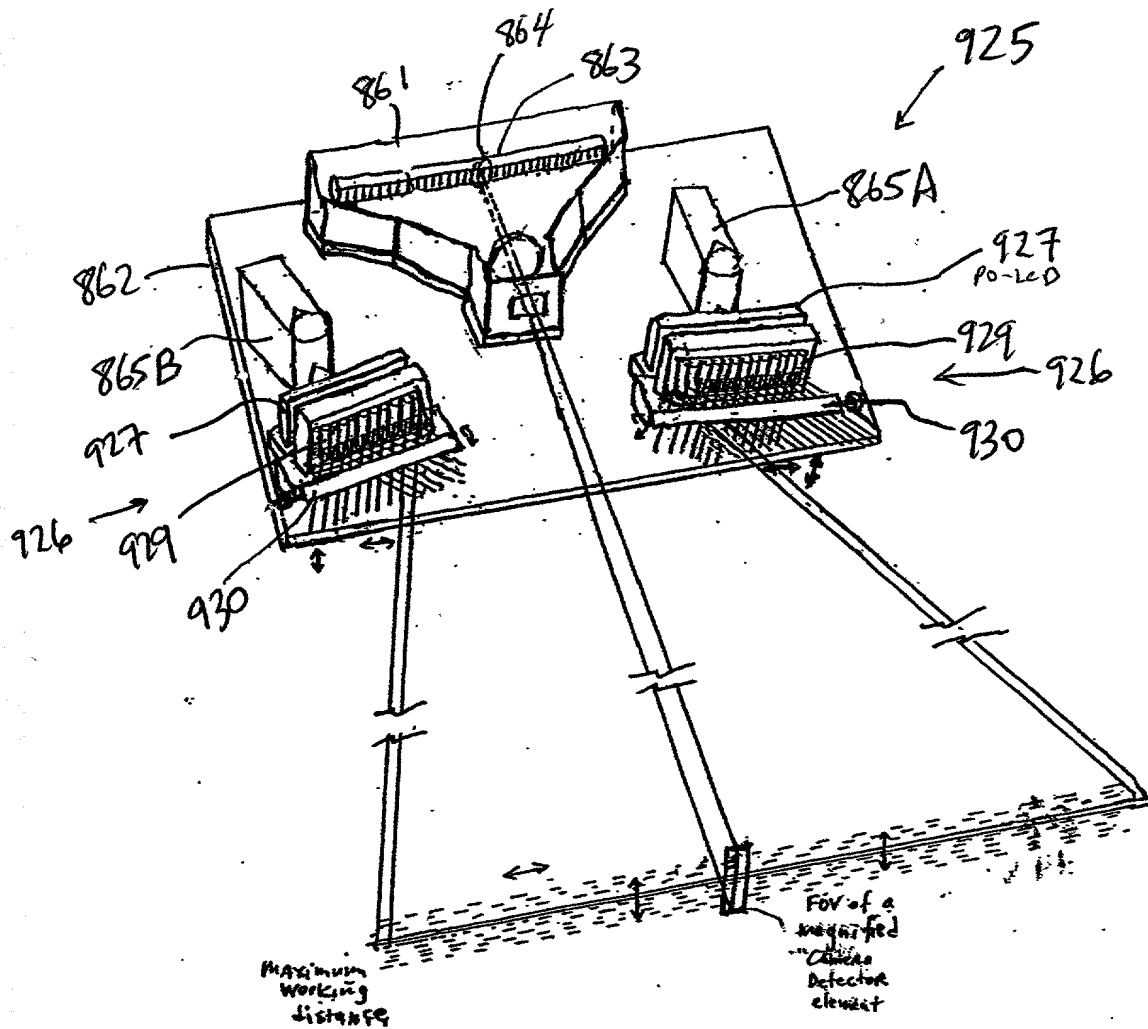


FIG. 1I25F2





\* Lateral and Transverse Microoscillation of PLIB

925

FIG. 1I25G1

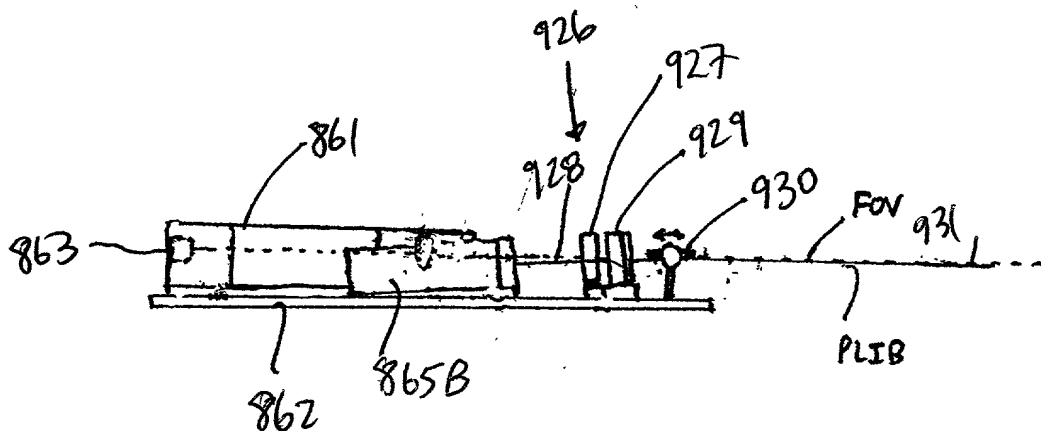


FIG. 1I25G2

78/ 332

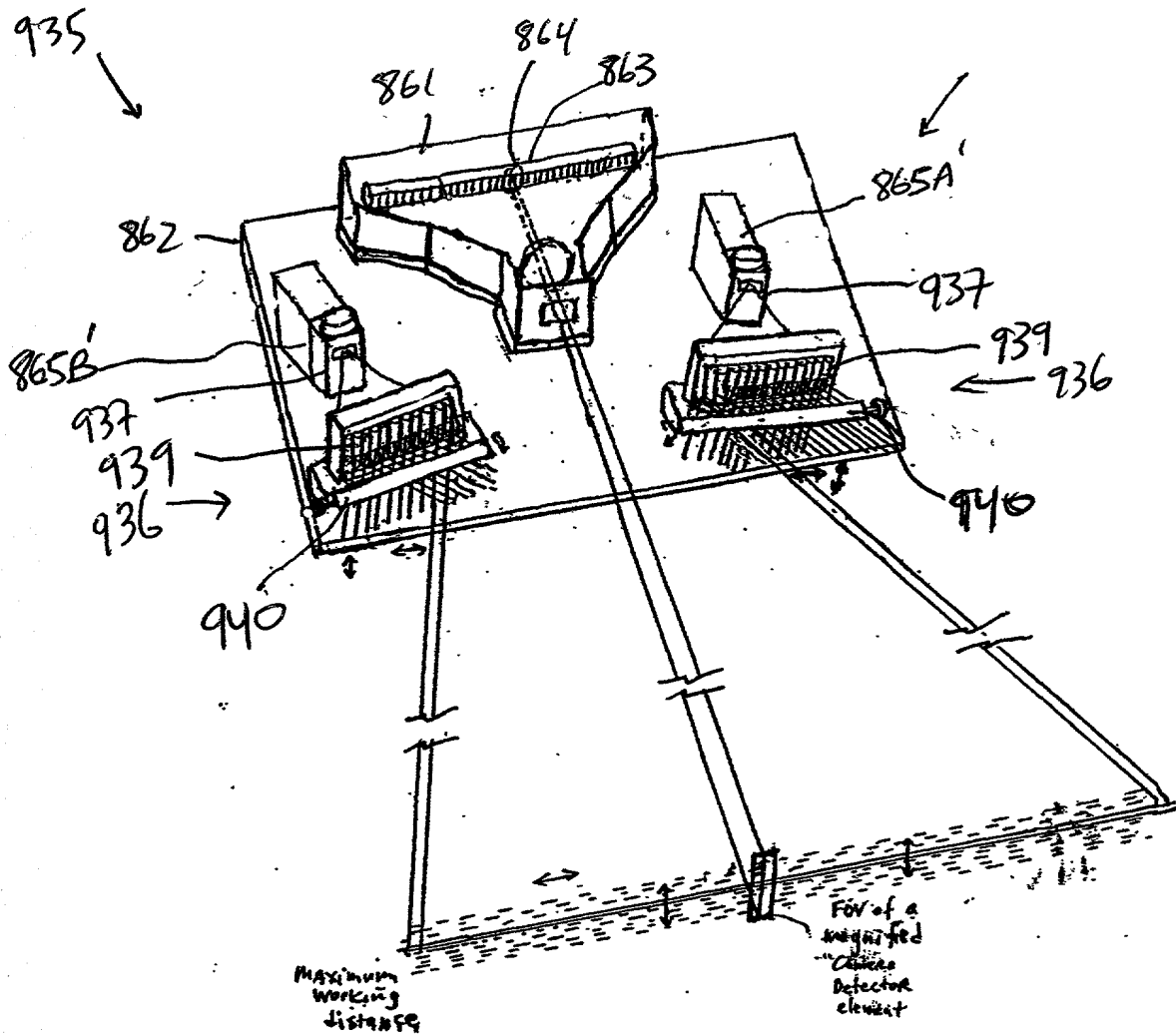


FIG. 1I25 H1

\* Lateral and Transverse Microoscillation of PLIB

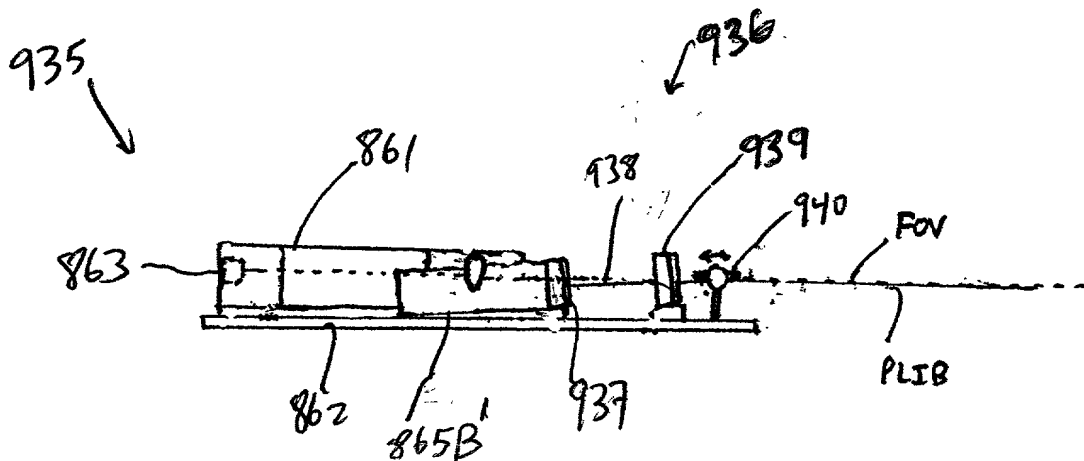
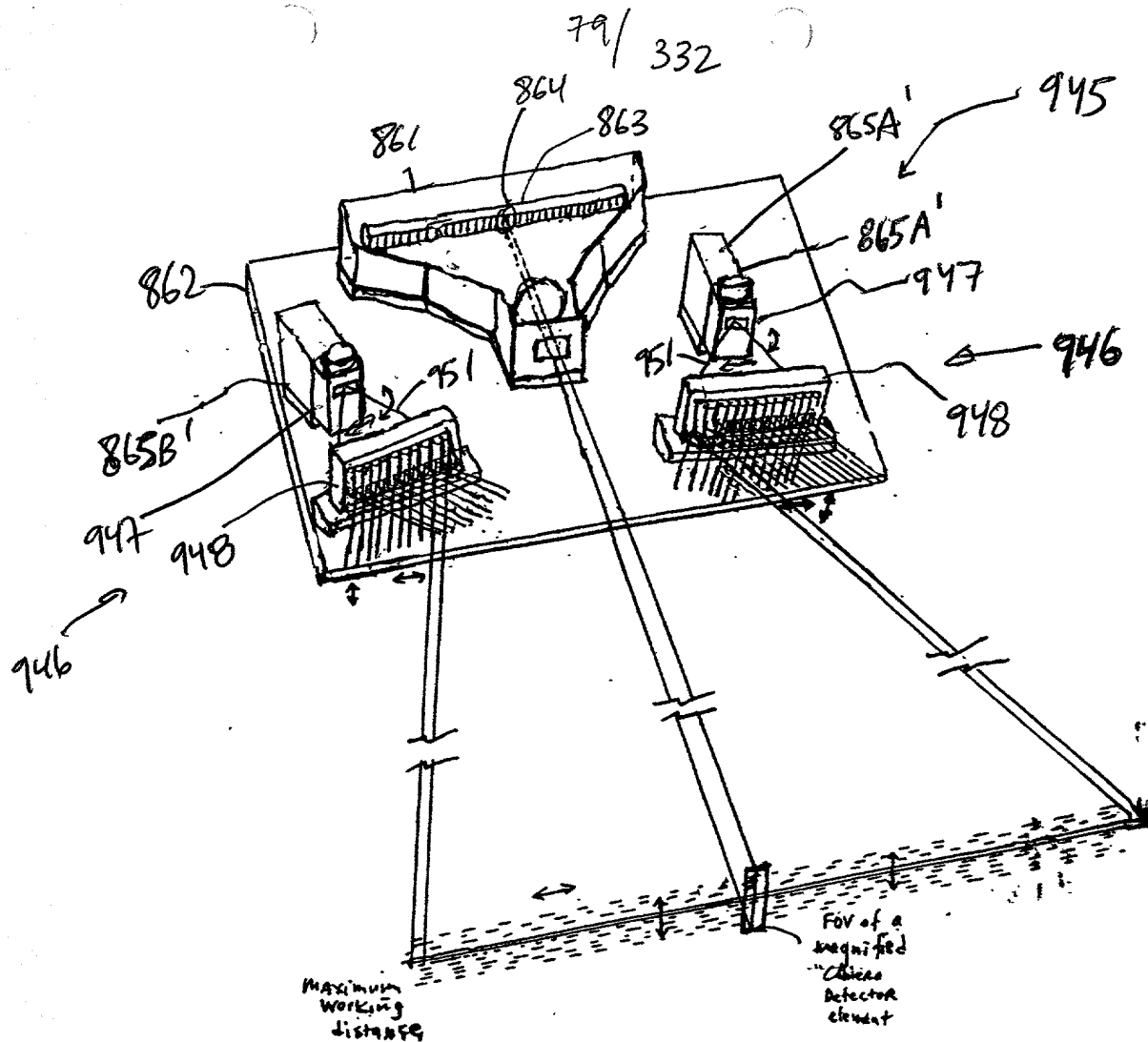


FIG. 1I25 H2



Lateral and Transverse Oscillation of PLIB

FIG. 1I25I1

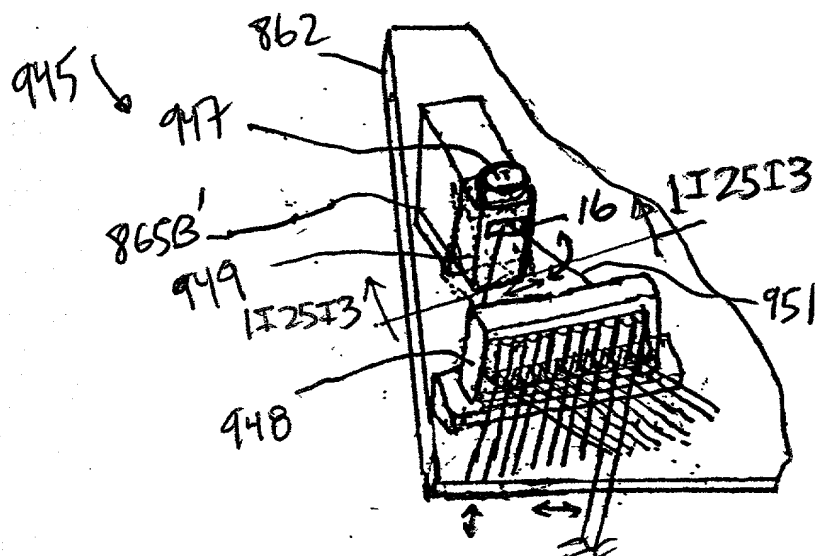


FIG. 1I25I2

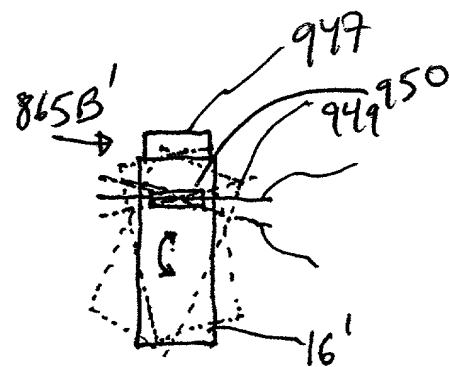


FIG. 1I25I3

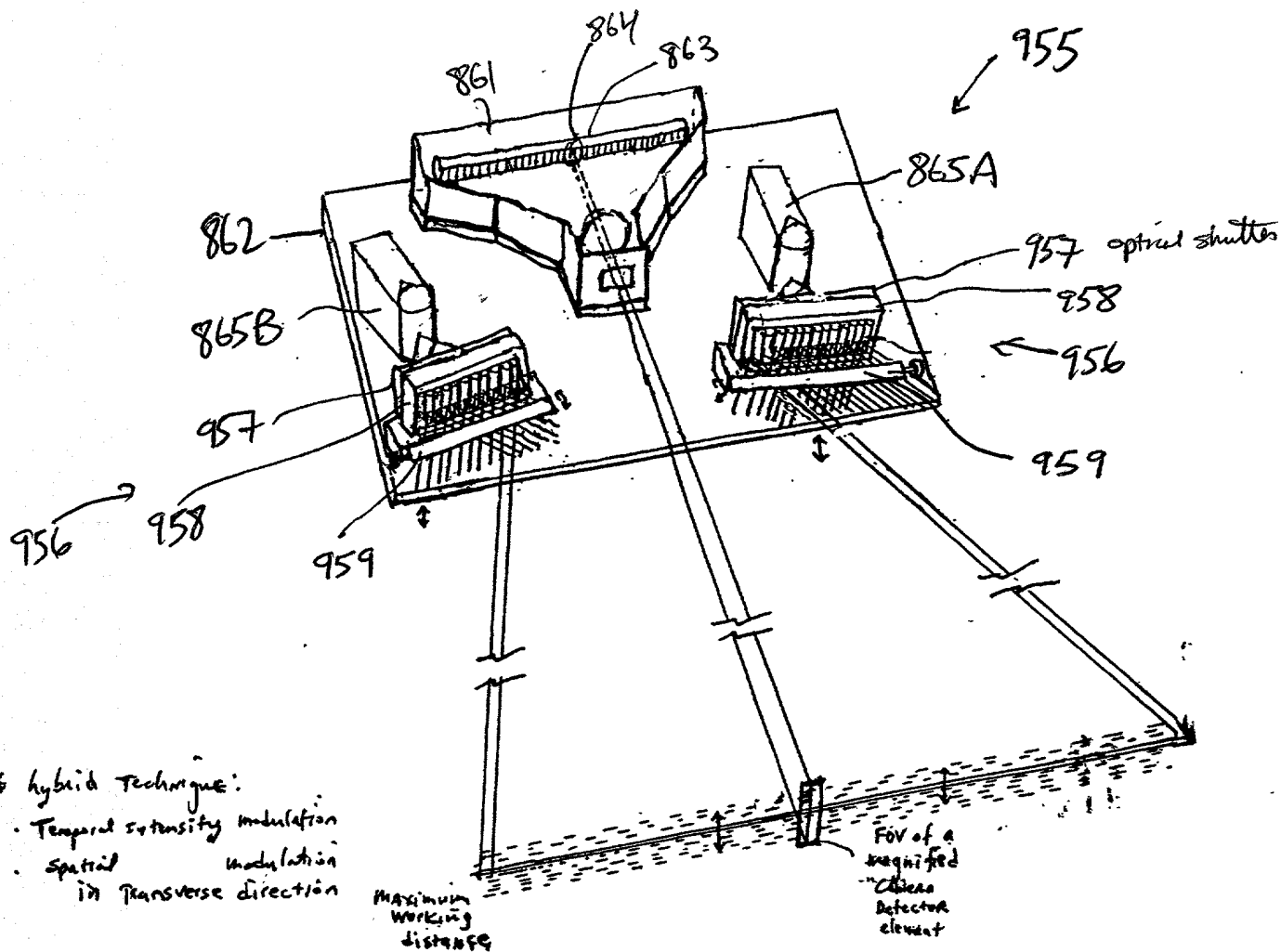


FIG. 1I25J1

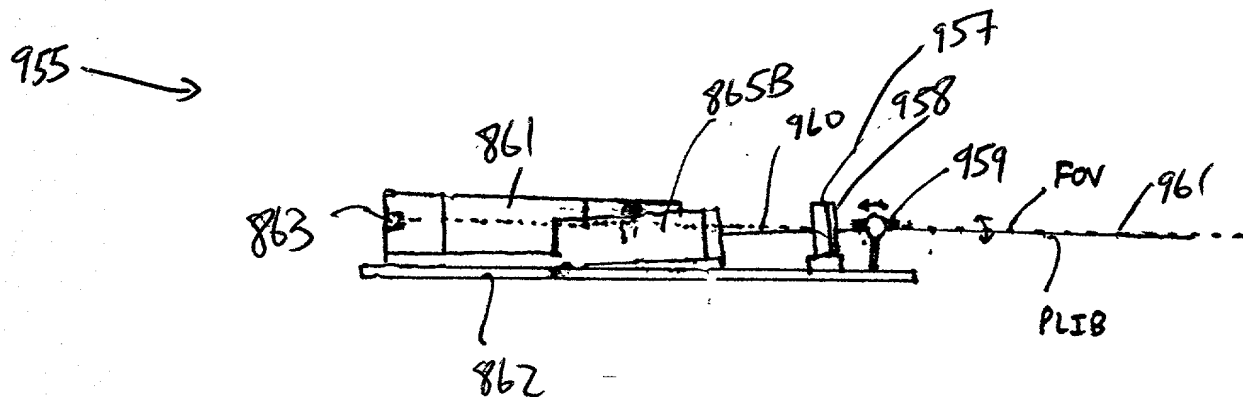
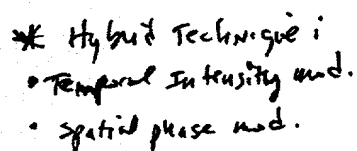


FIG. 1I25J2



\*  
TRANSVERSE  
Hysteresis of PLIB



FIG. 1I 25KZ

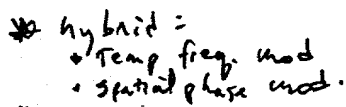


FIG. 1I Z5L1



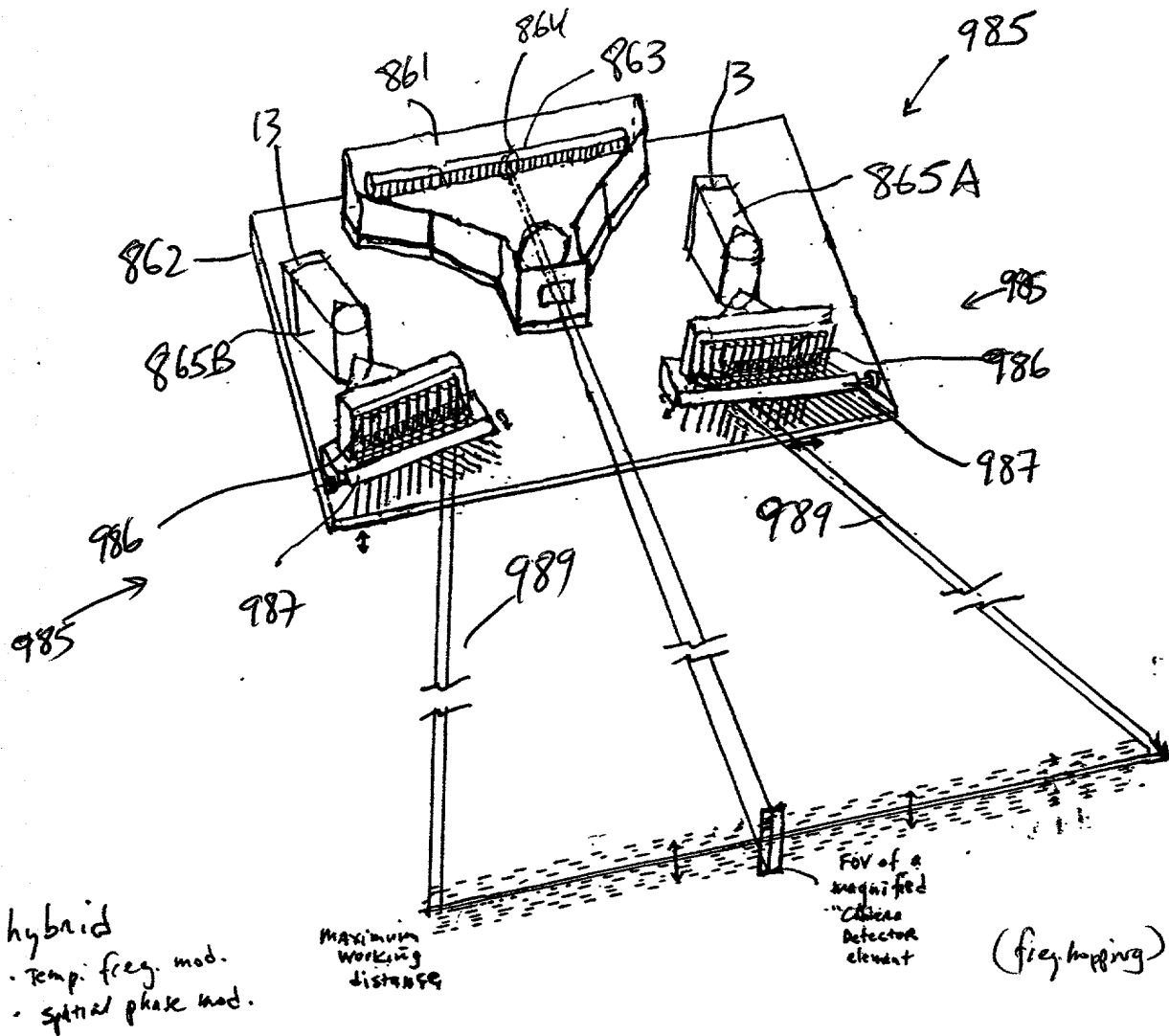


FIG. 1I25M1

Transverse  
Microscillation of PLIB

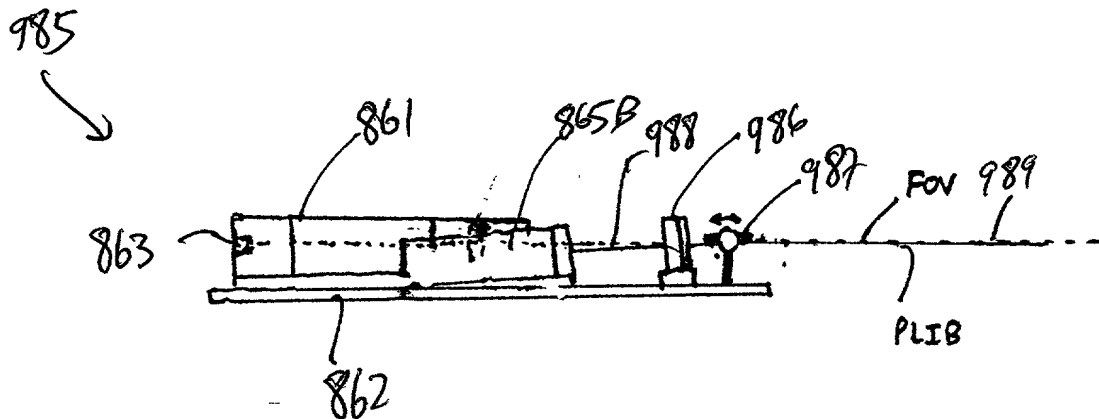
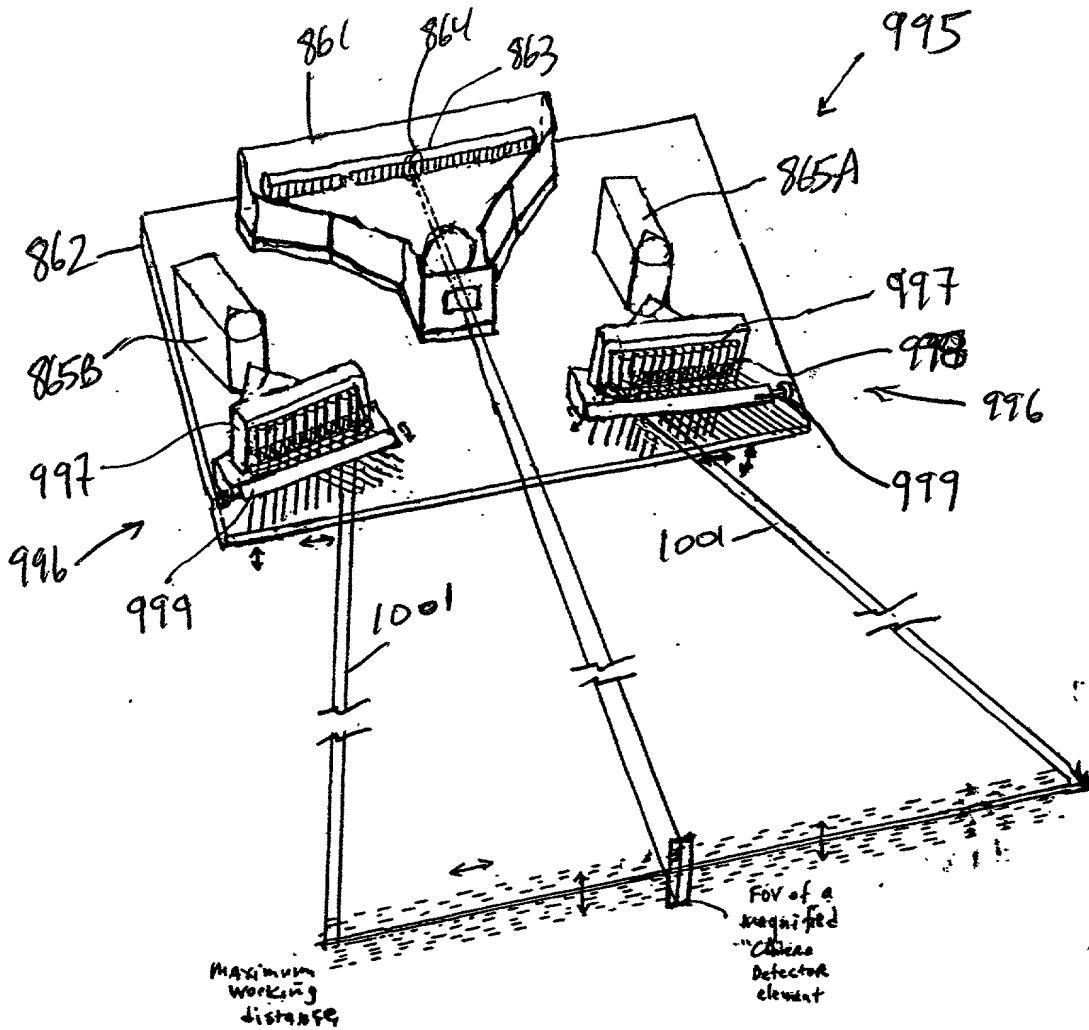


FIG. 1I25M2

84/332



- \* hybrid:
  - spatial intensity mod.
  - spatial phase
- \* Lateral and Transverse Modulation of PLIB

FIG. 1I25N1

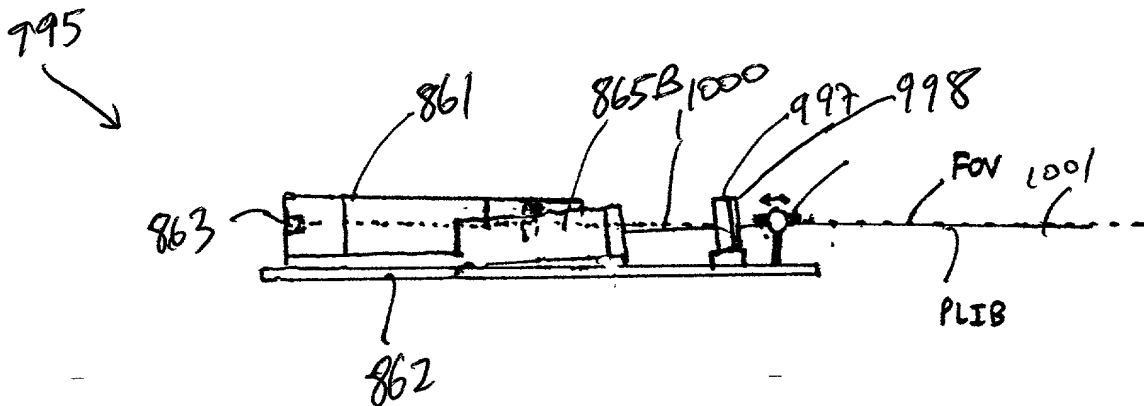


FIG. 1I25NZ



85/332

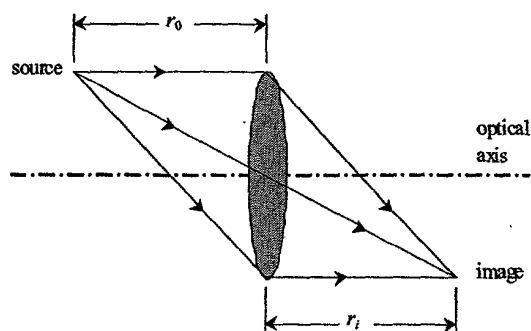


FIG. 1H1

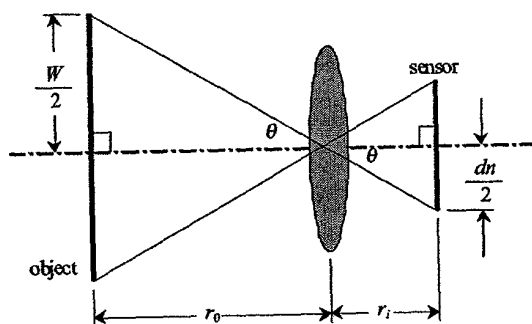


FIG. 1H2

10066803-020602

86/332

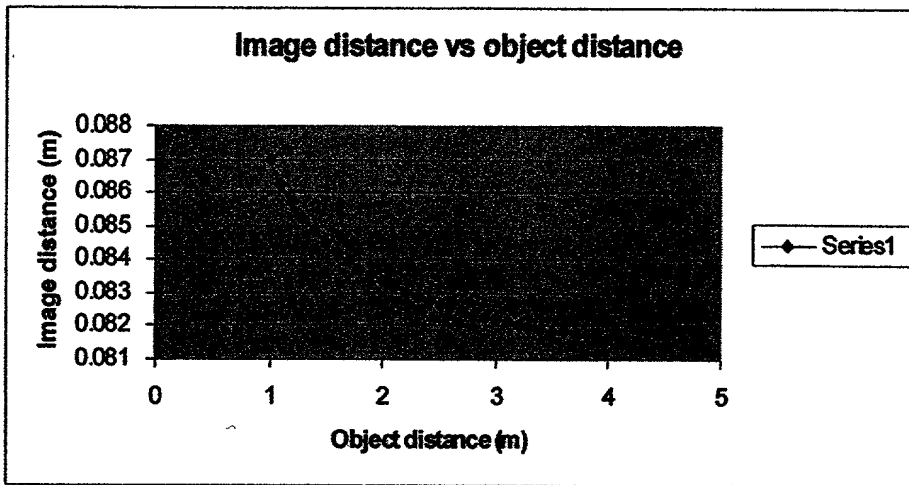


FIG. 1H3

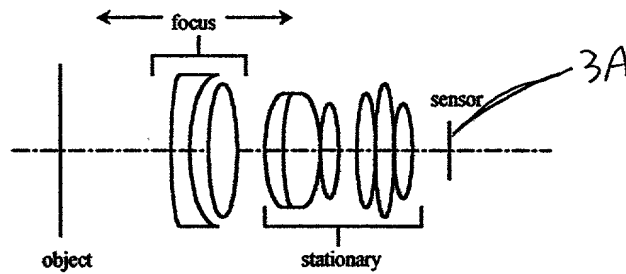


FIG. 1H4

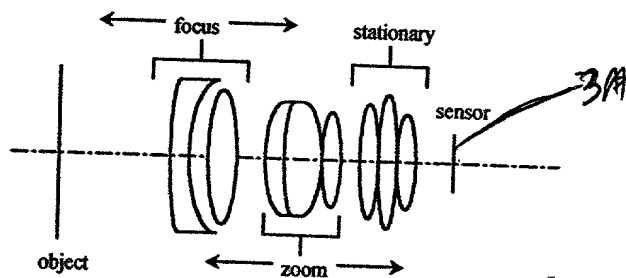


FIG. 1H5

87/332

Fixed focal length lens  
cases

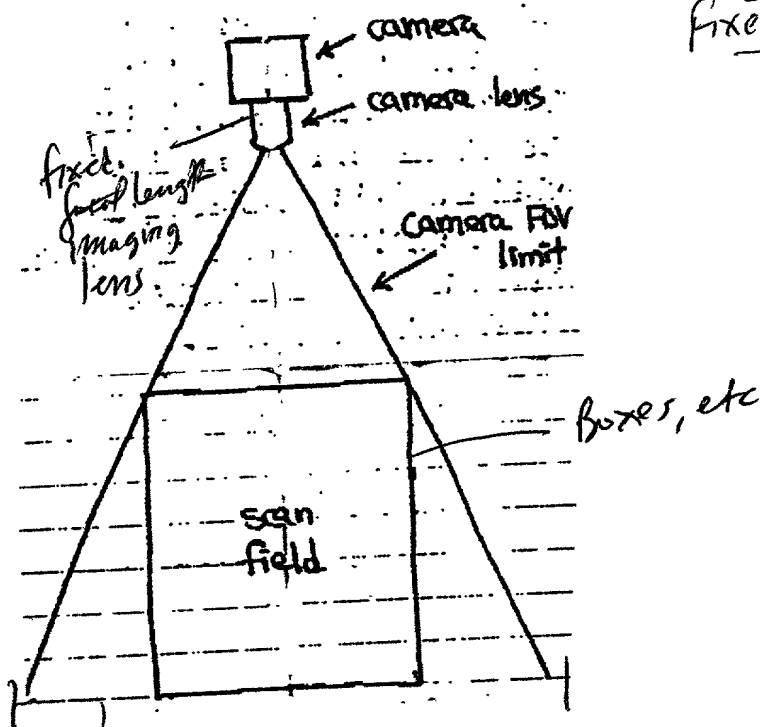
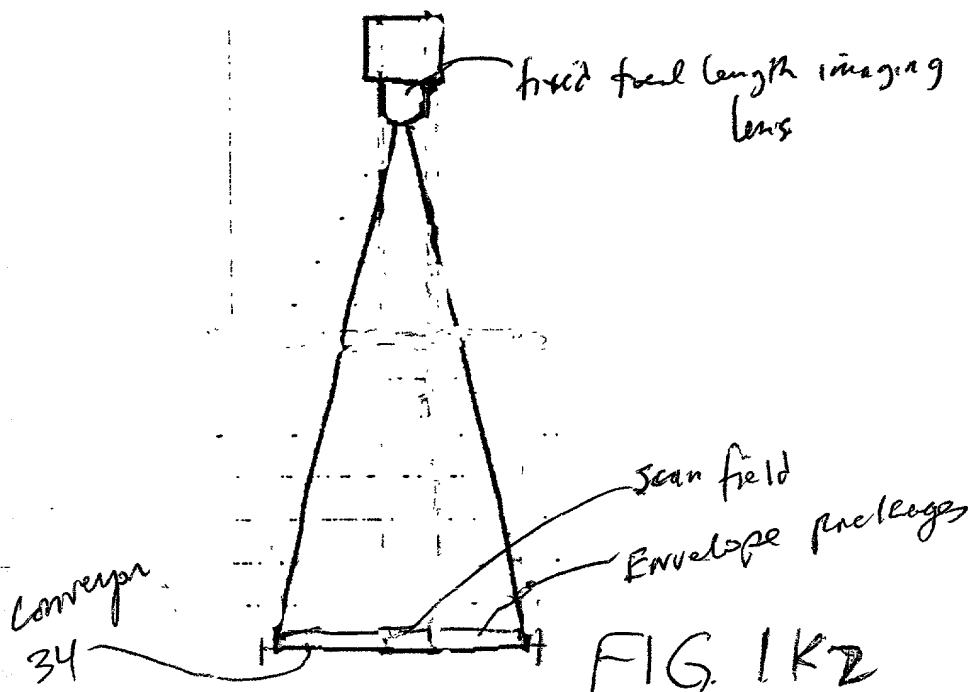


FIG. 1K1  
conveyor 34



conveyor  
34

FIG. 1K2

A hand-drawn schematic diagram of a linear camera system. On the left, a rectangular box labeled '3' represents the camera. An arrow points from the camera towards a series of three mirrors. The first mirror is labeled '9A' and is tilted at a 45-degree angle. Above it, the text 'For (of linear camera, shown edge on)' is written with an arrow pointing to the mirror. The light path continues to a second mirror labeled '9B', which is also tilted at 45 degrees. From mirror '9B', the light path reflects down to a horizontal mirror labeled '9C' at the bottom. From '9C', it reflects up to a horizontal mirror labeled '9D' at the top. From '9D', it reflects down to a third tilted mirror labeled '9E' on the right. Finally, the light path reflects down to the camera '3'. The entire setup is enclosed in a dashed rectangular frame. The label '88/332' is written at the top center.

A perspective view of the system 10. The system includes a base 3 with a camera 38 and a display 35. The display shows a 3D object 96 and a field of view (FOV) indicated by a double-headed arrow. A user 22 is shown interacting with the system.

FIG. 1L2

89/332

Pixel power density vs. object distance (general example)

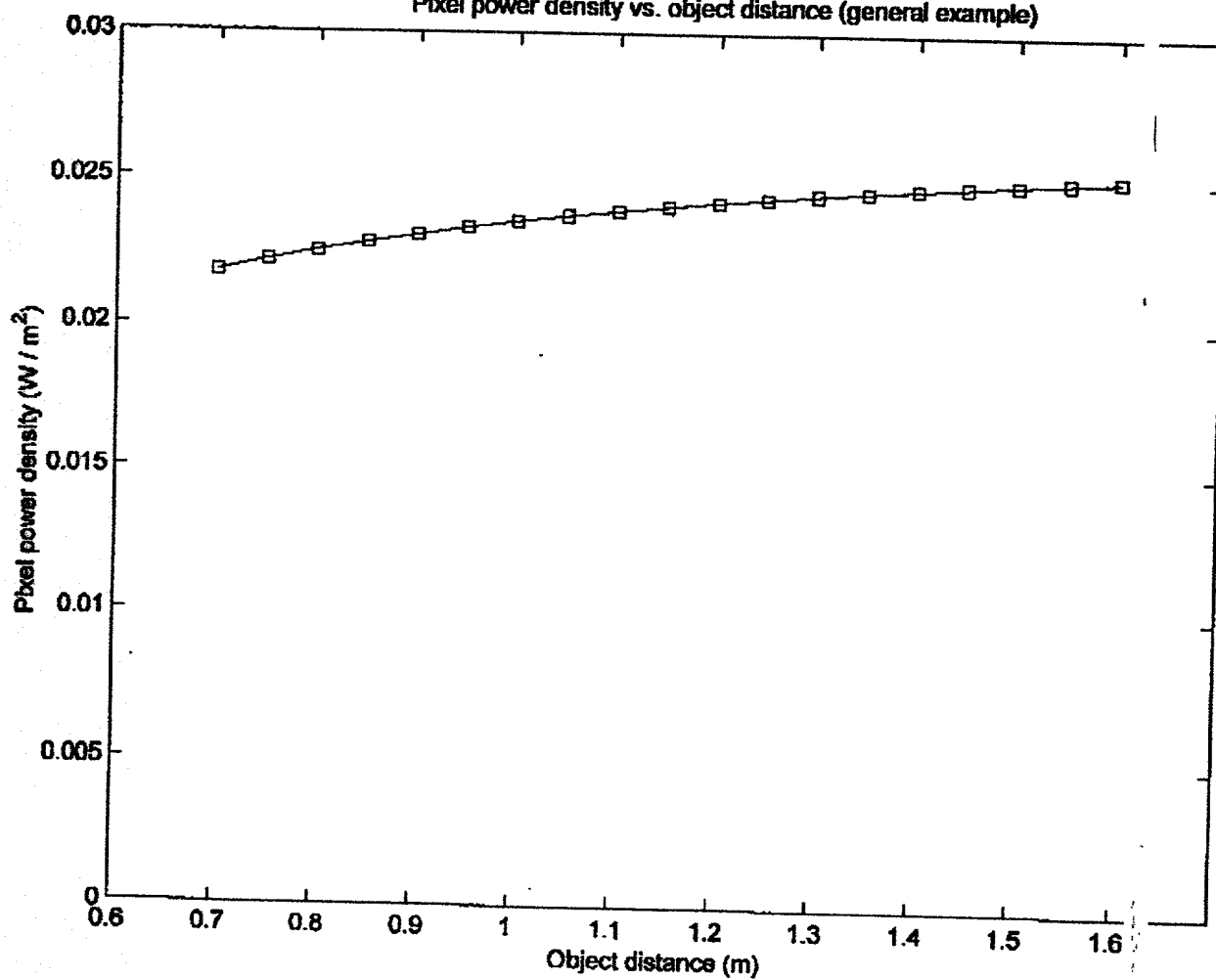


FIG-1M1

90/332

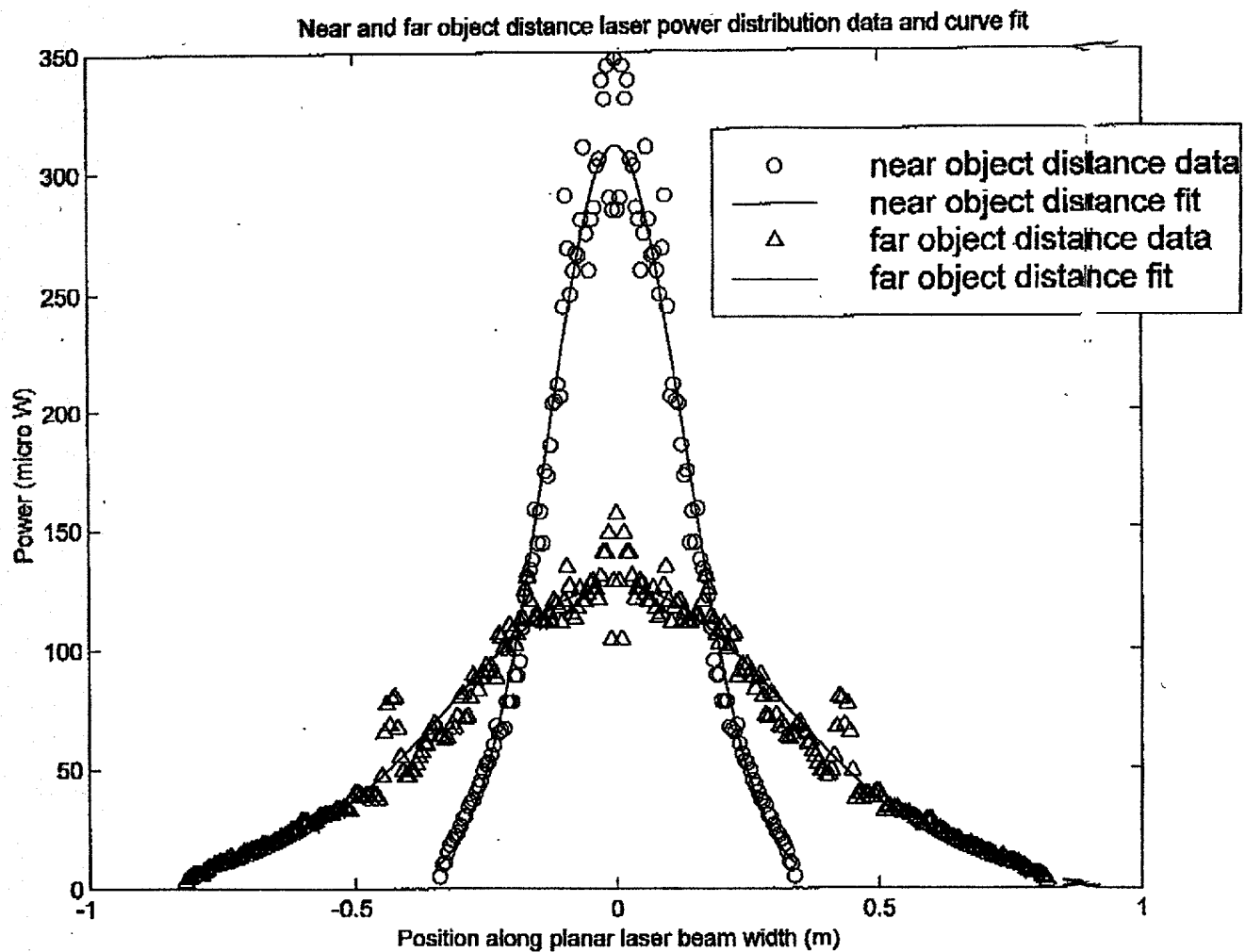


FIG. 1M2

91/332

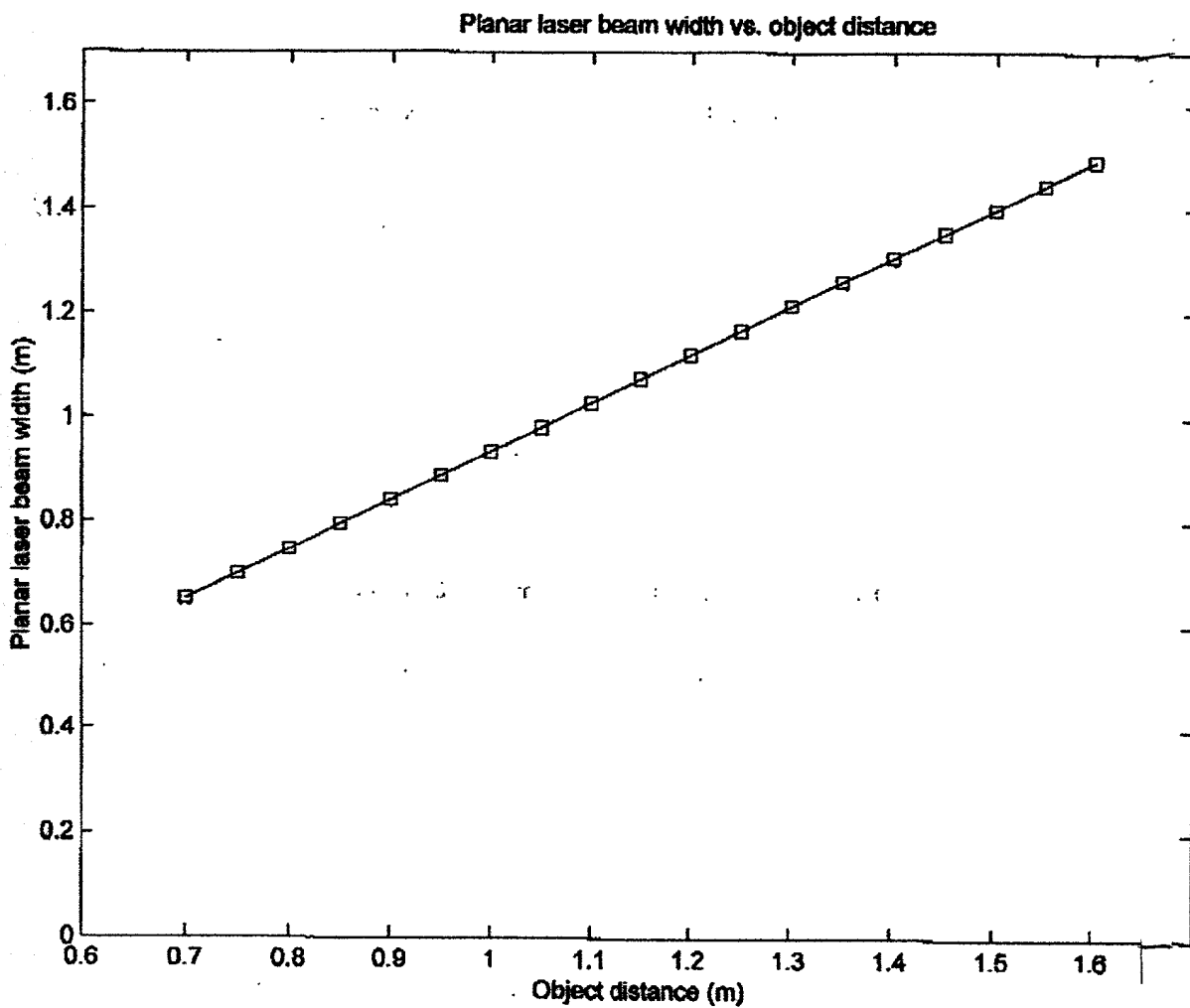


FIG. 1M3

92/332

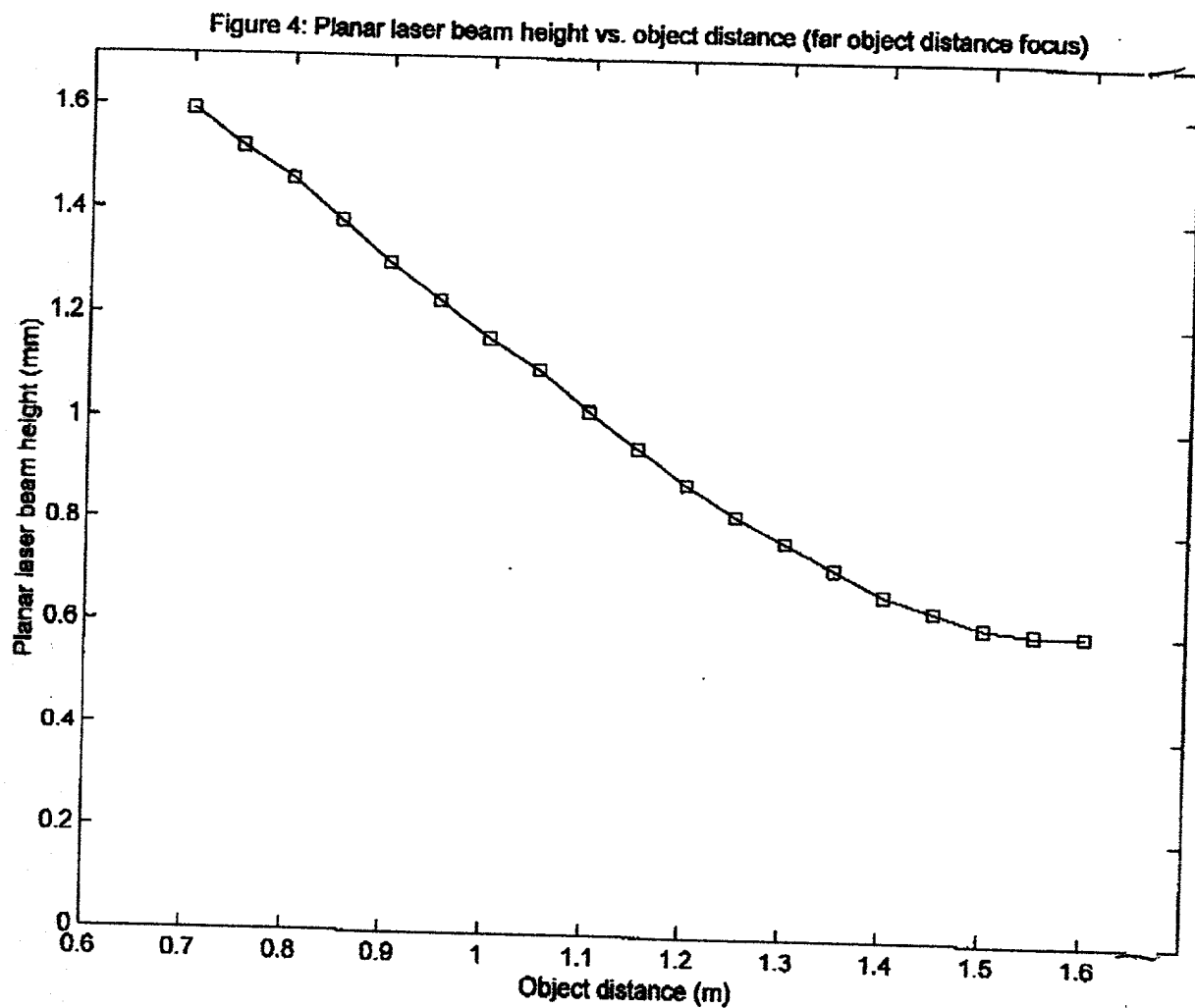


FIG. 1M4



93/332

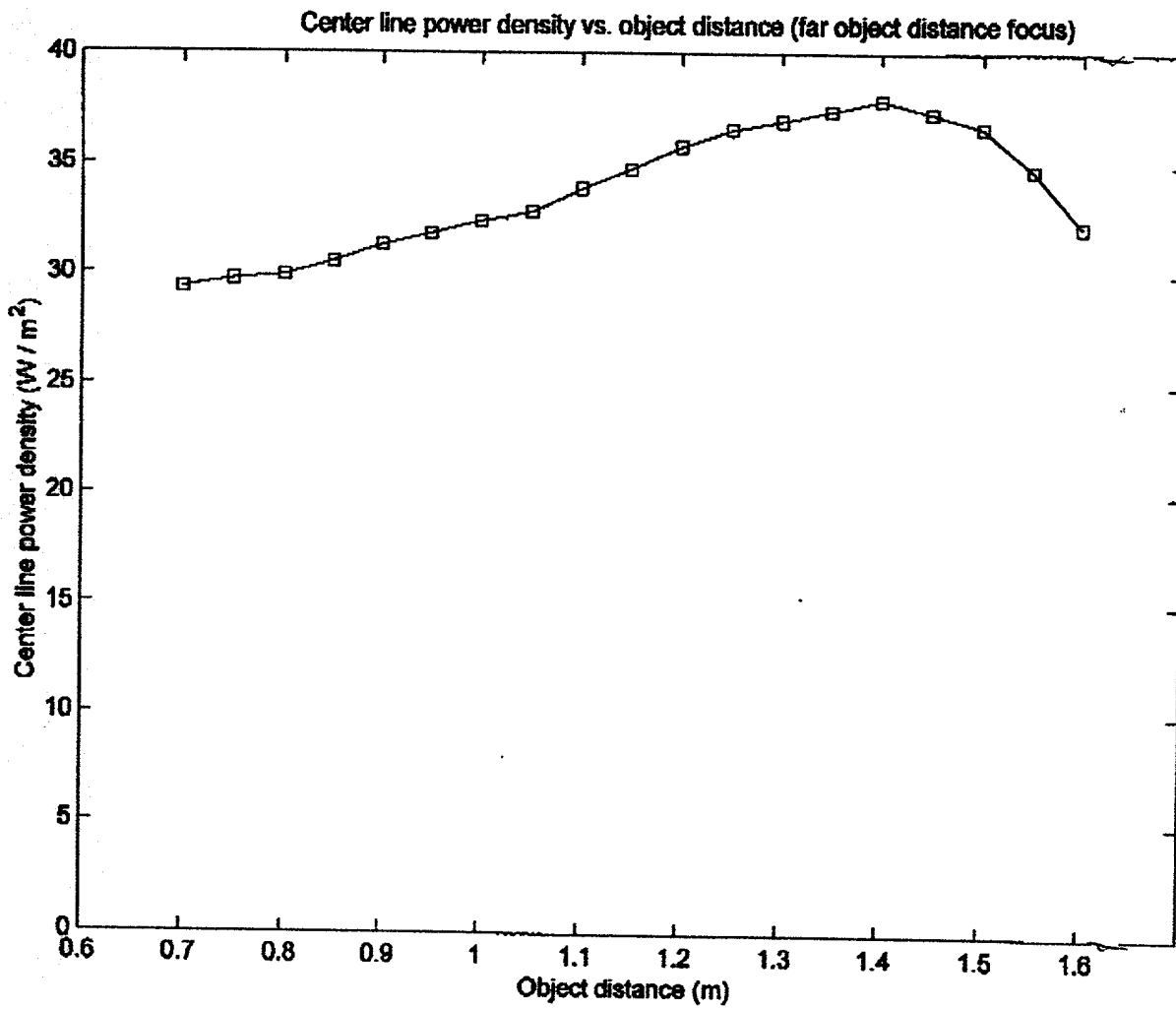


FIG. -IN

94/332

Figure 6: Pixel power densities vs. object distance

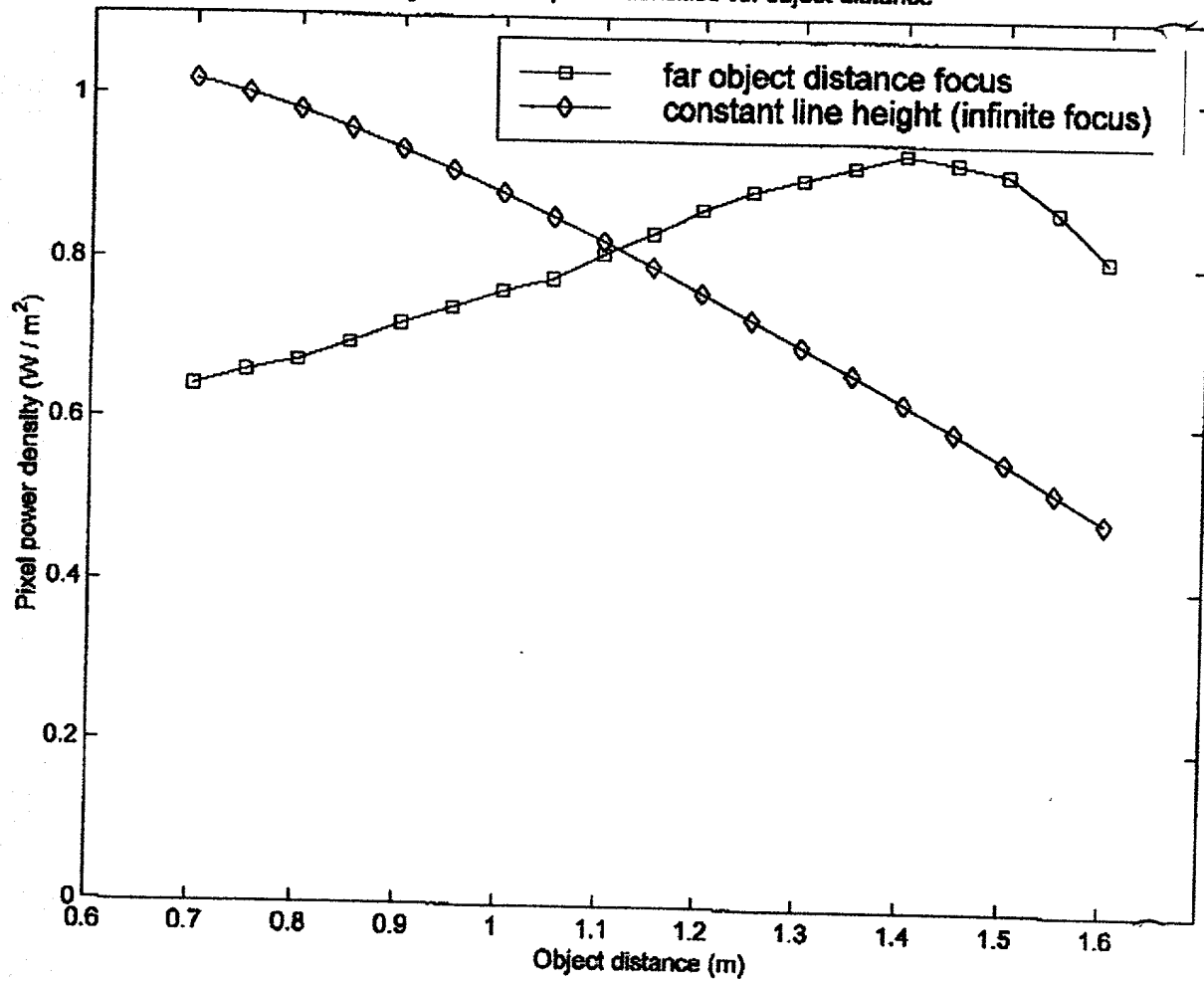
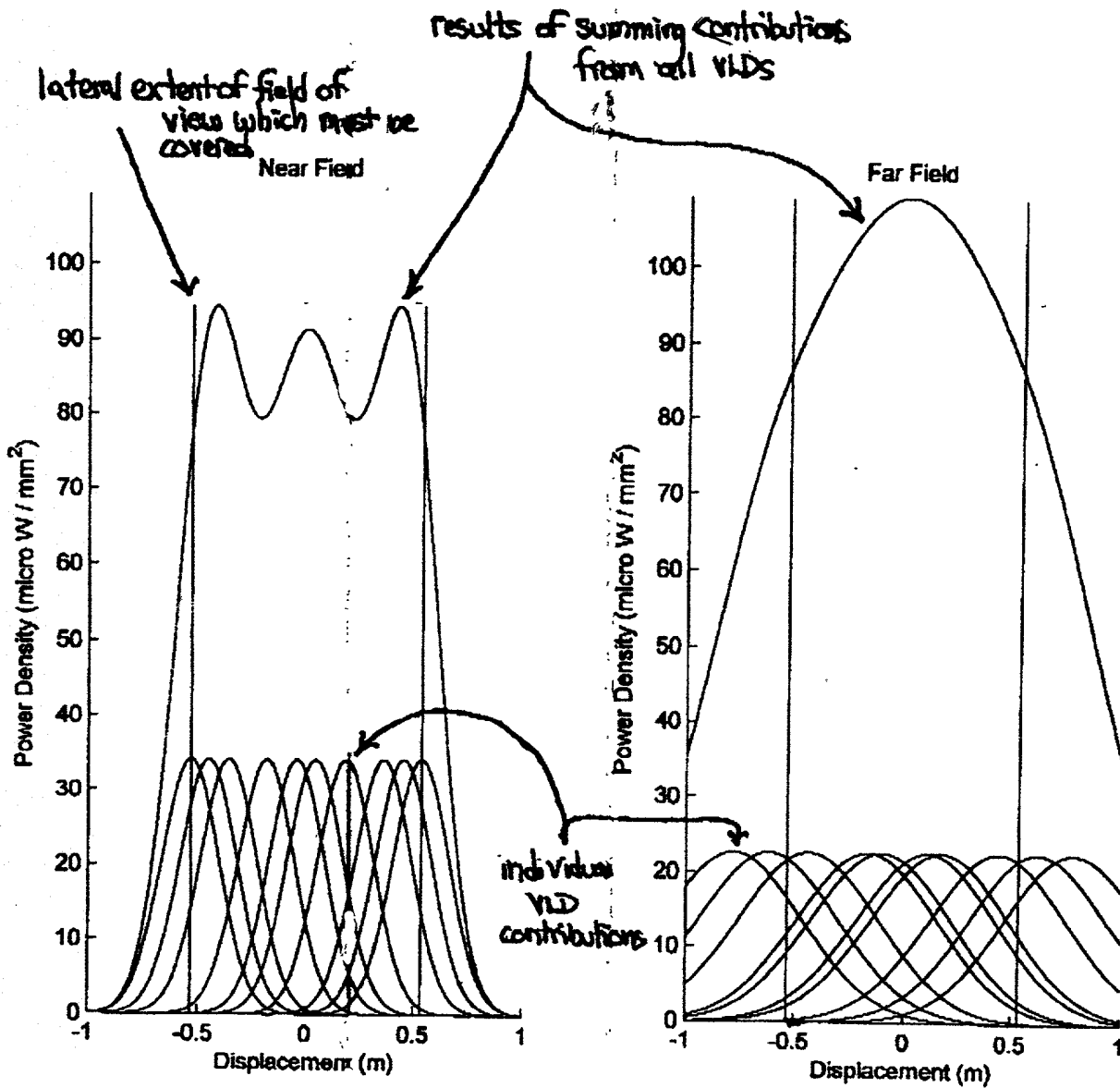


FIG. 10

95/332



96/332

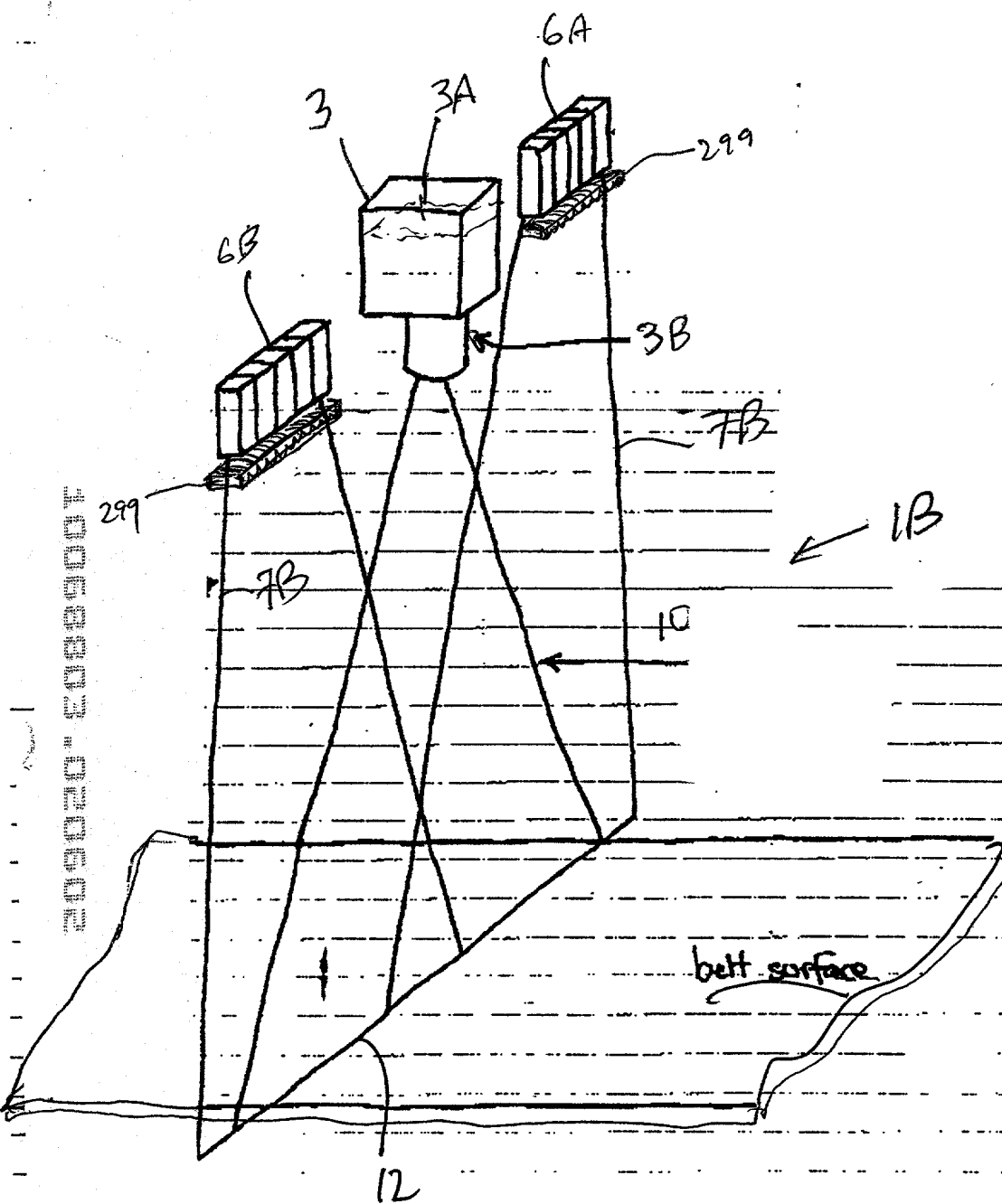
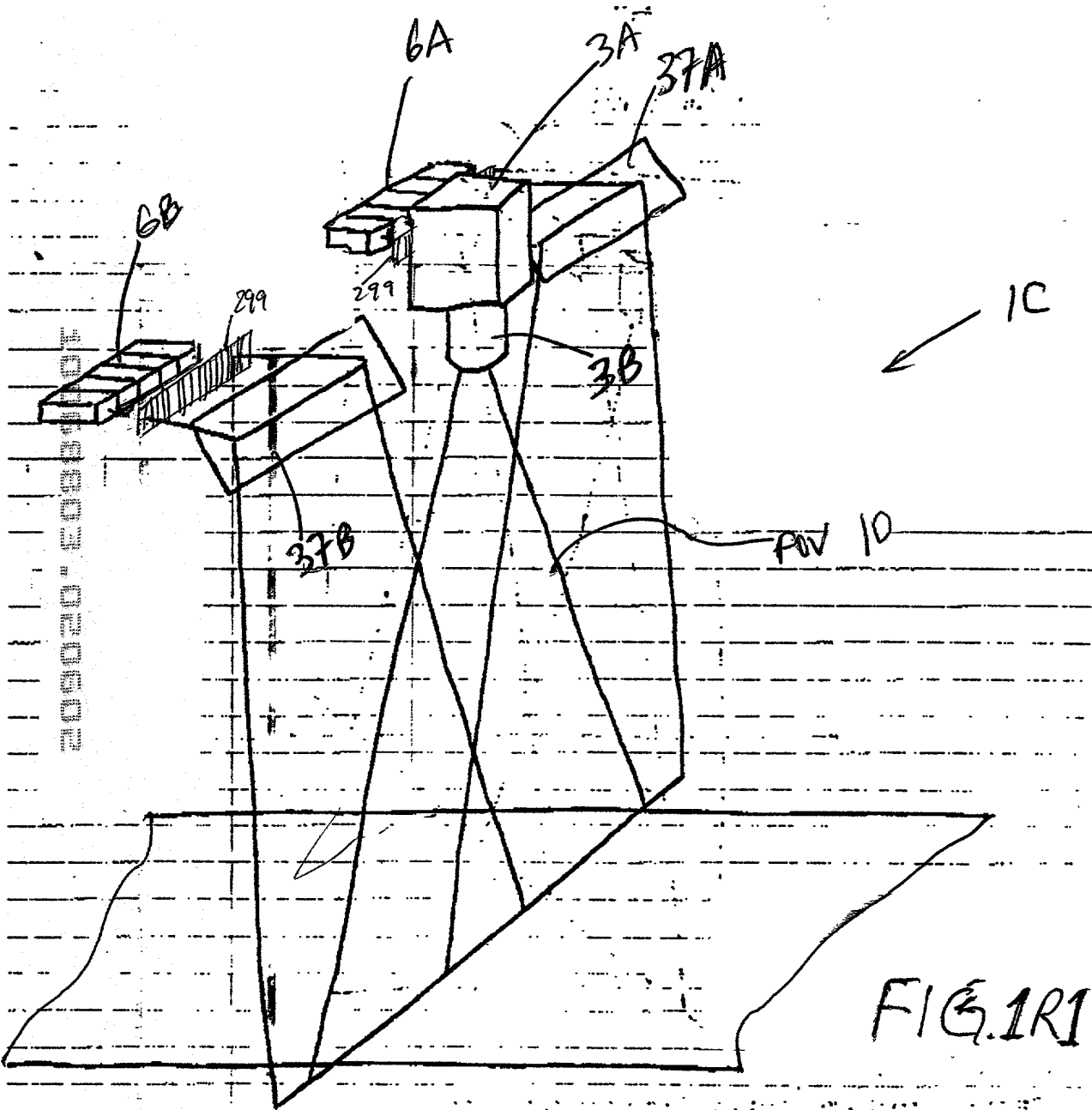


FIG. 1Q1



98/332



Fixed focal length / fixed focal distance

FIG. 1R2

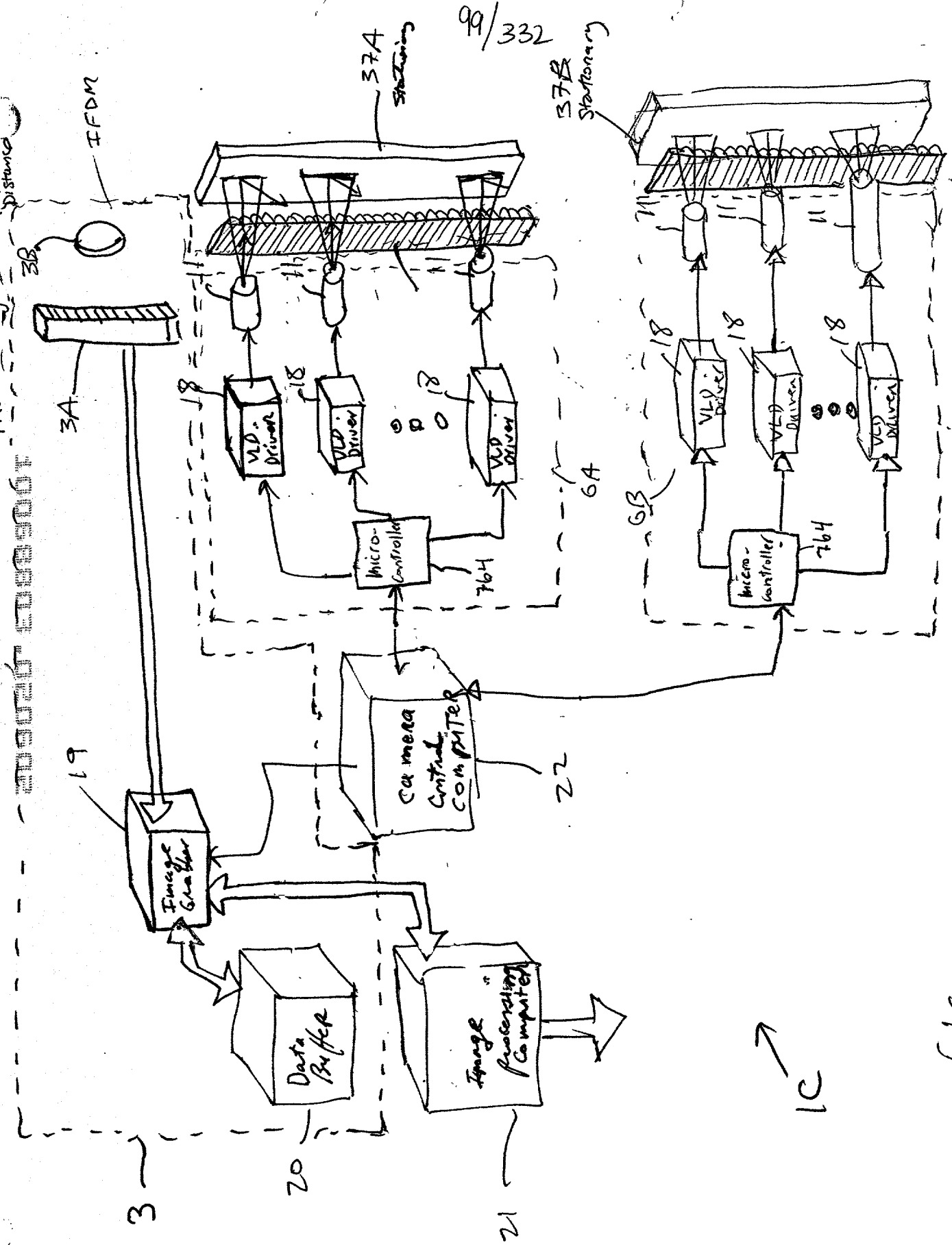


FIG. 1R2

IC

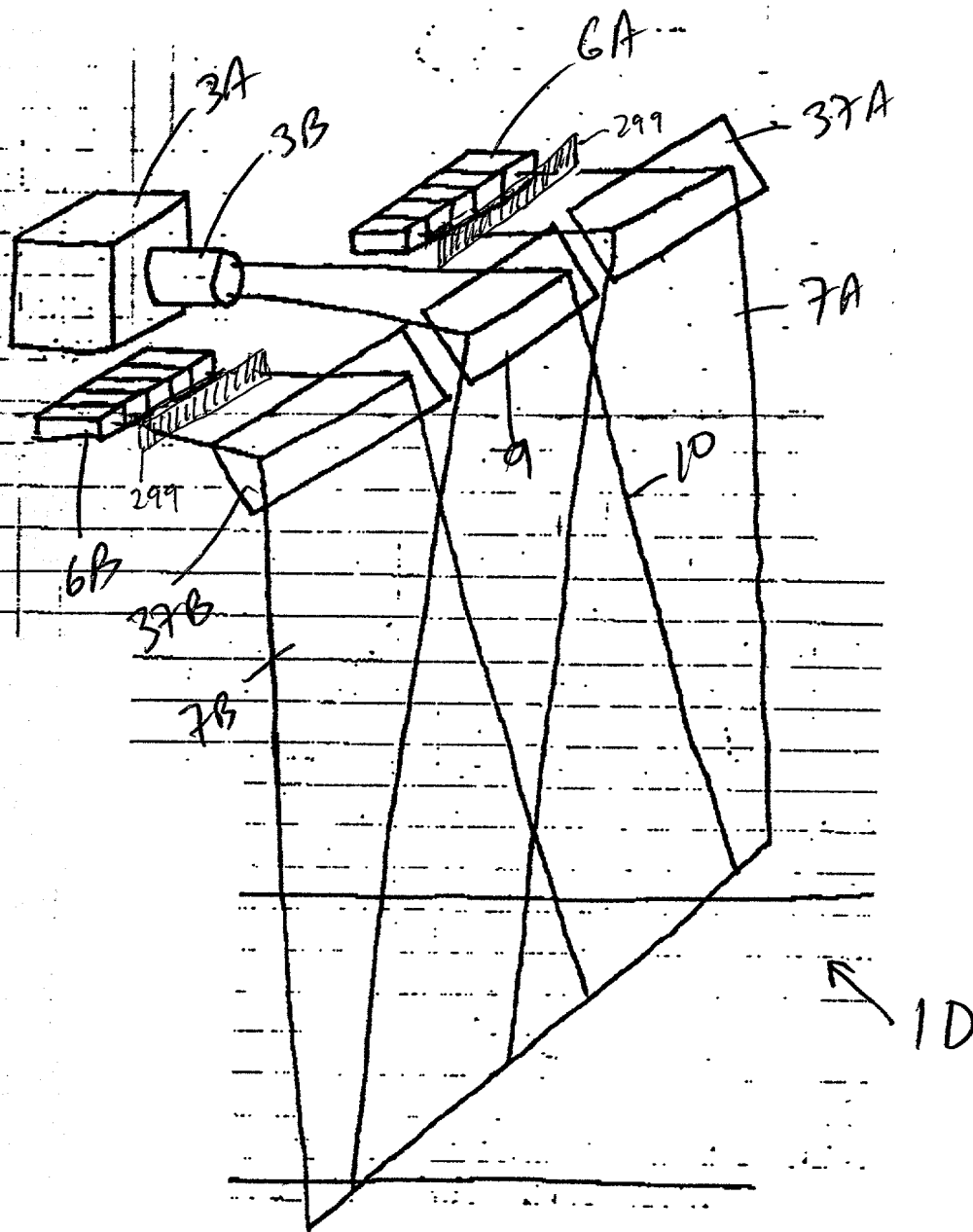


FIG. 151



FIG. 152

10068303-020603

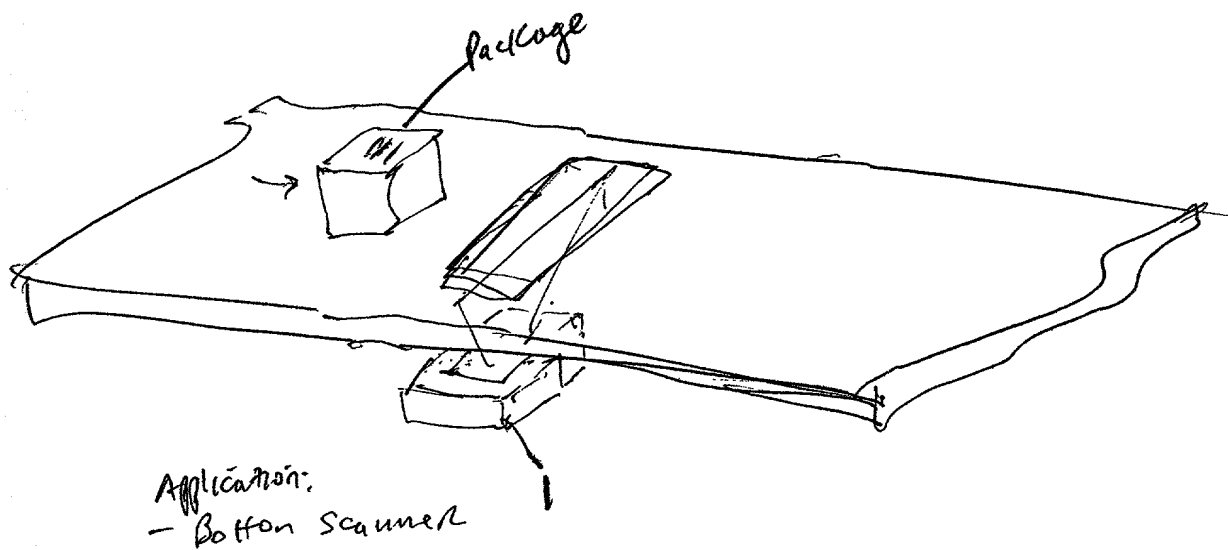


FIG. 1T



104/332

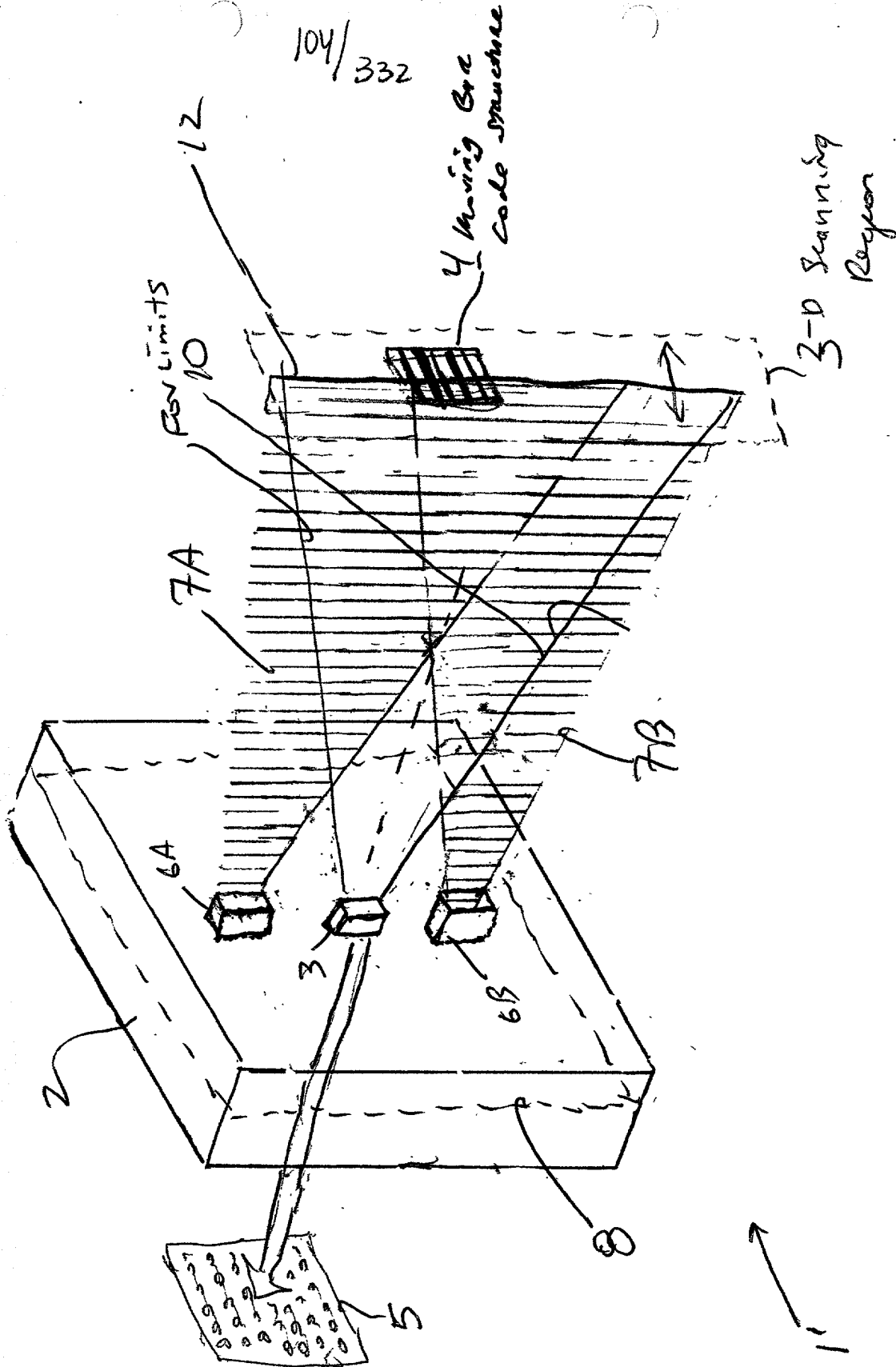


FIG. 1VI

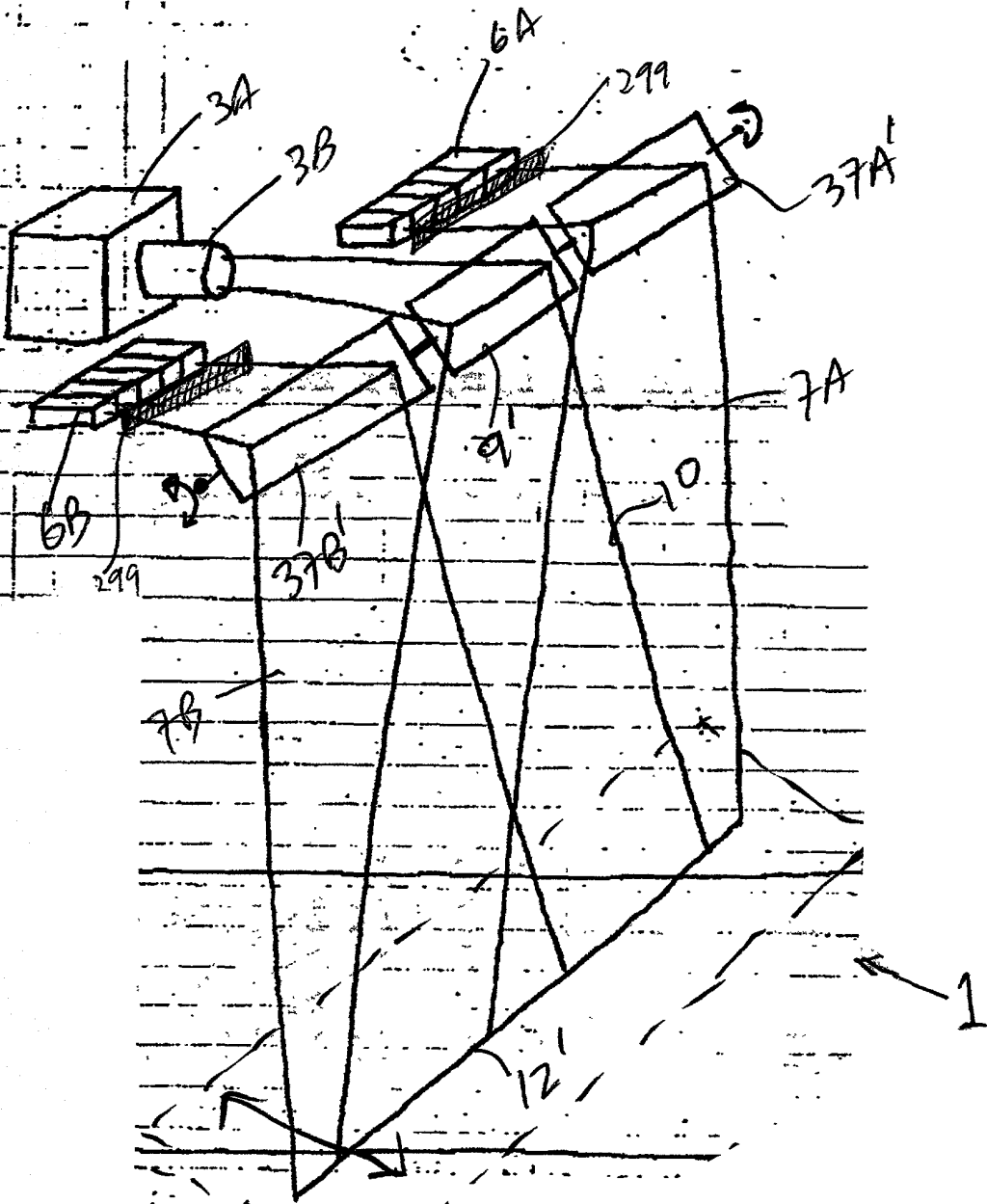


FIG. IV2

2-D  
region  
of  
space

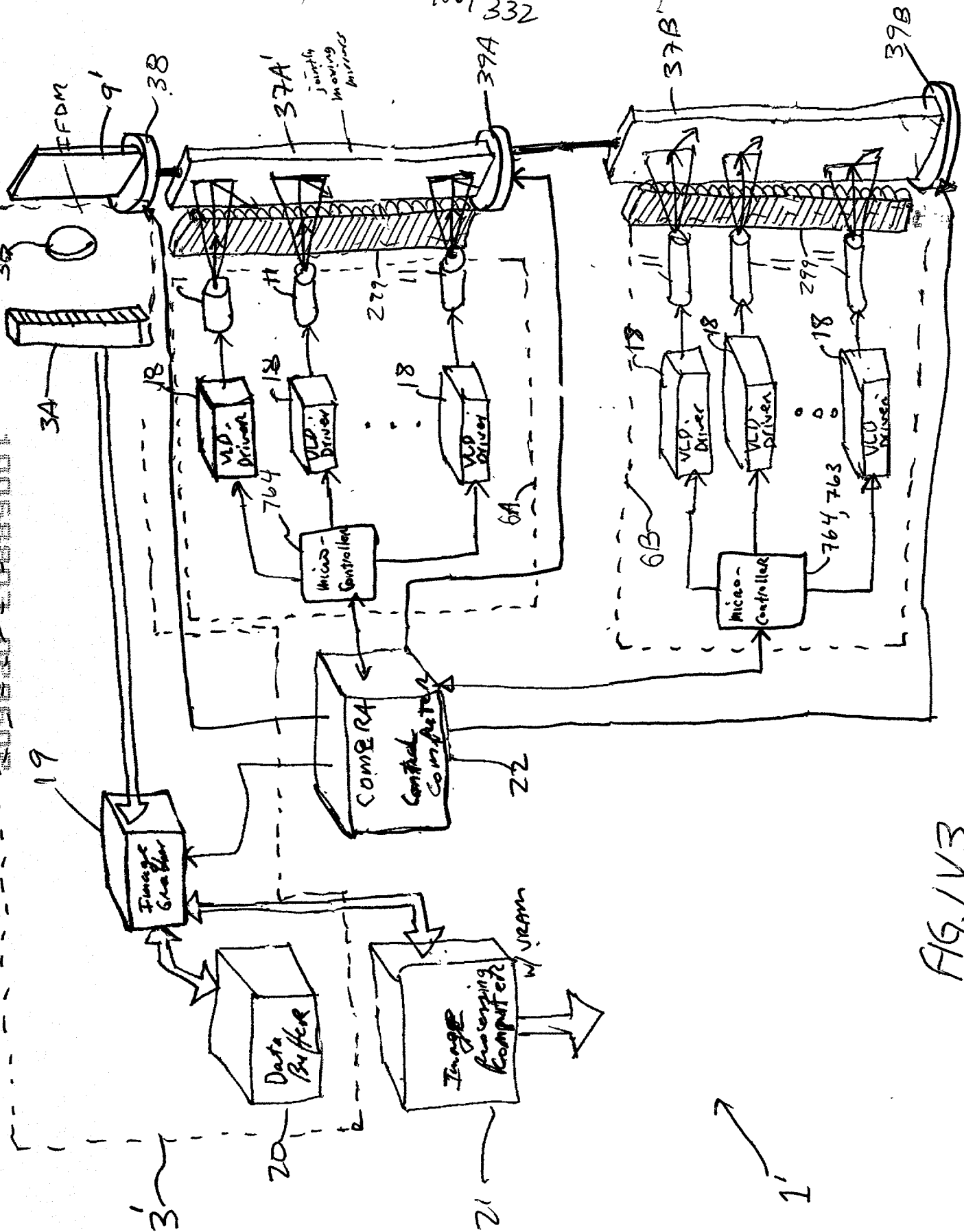
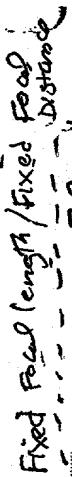


Fig. 1 V3

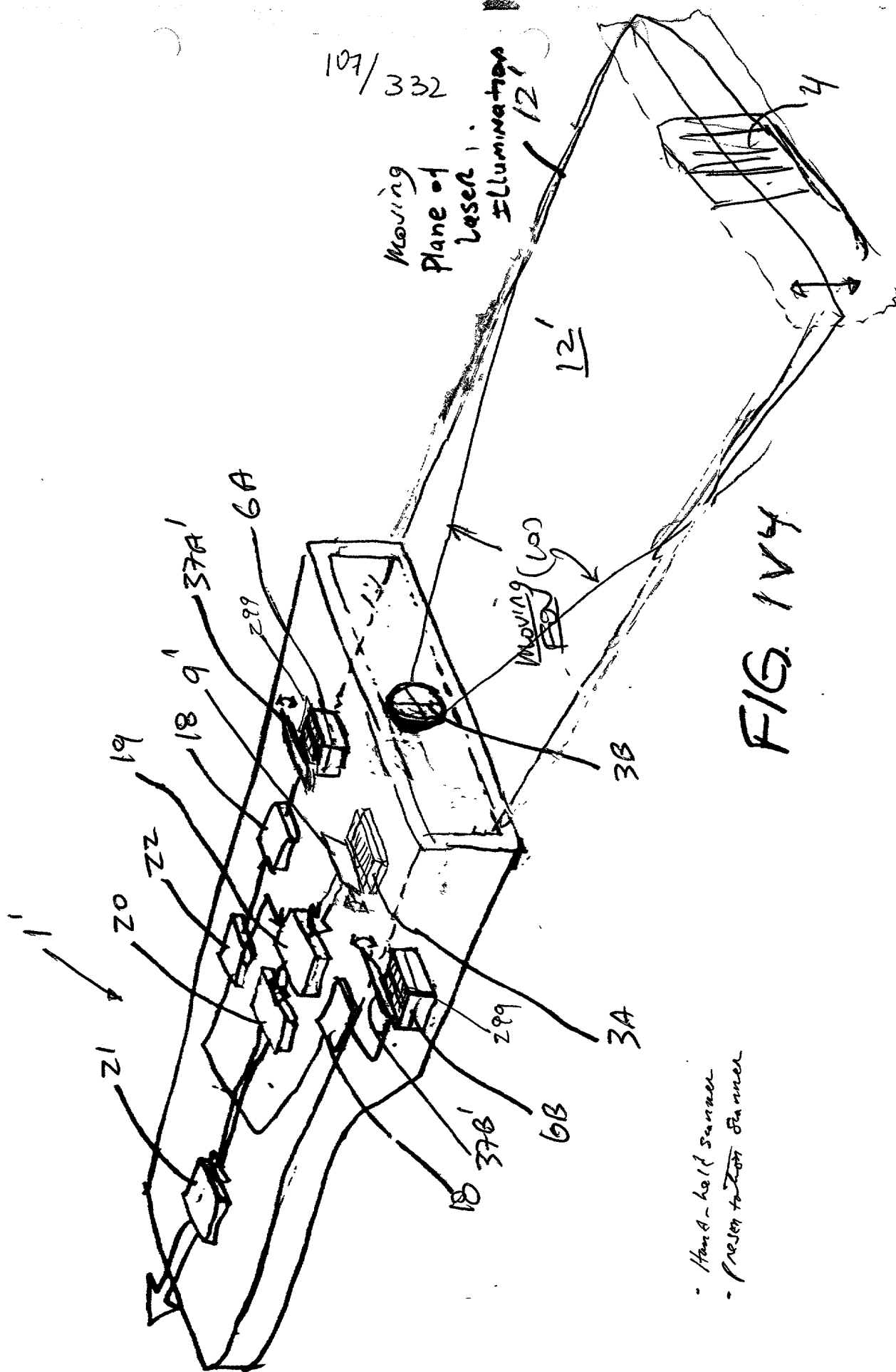


FIG. 1V4

- Hand-held scanner
- Present to ~~Top~~ Scanner

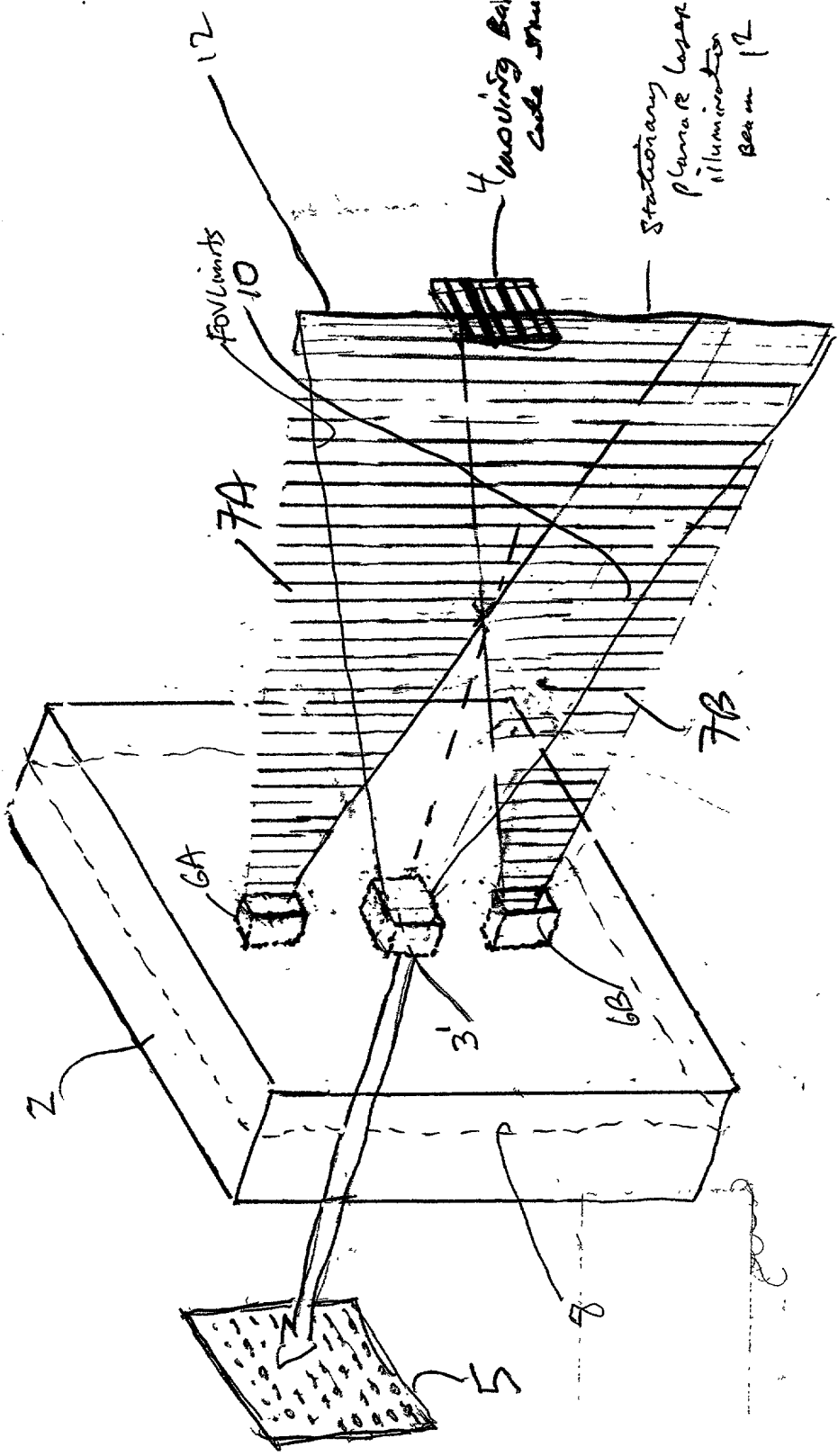


FIG. 2A



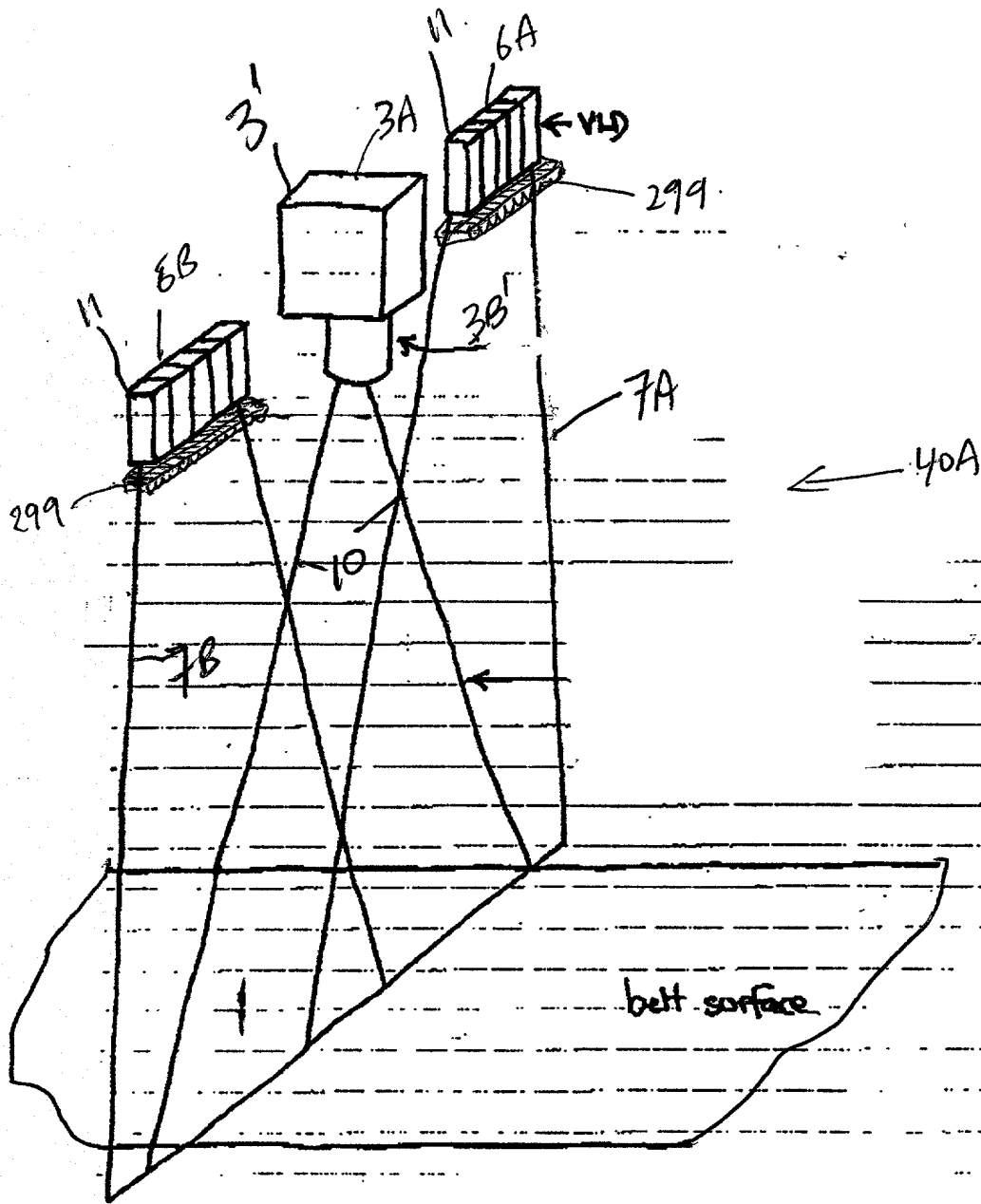
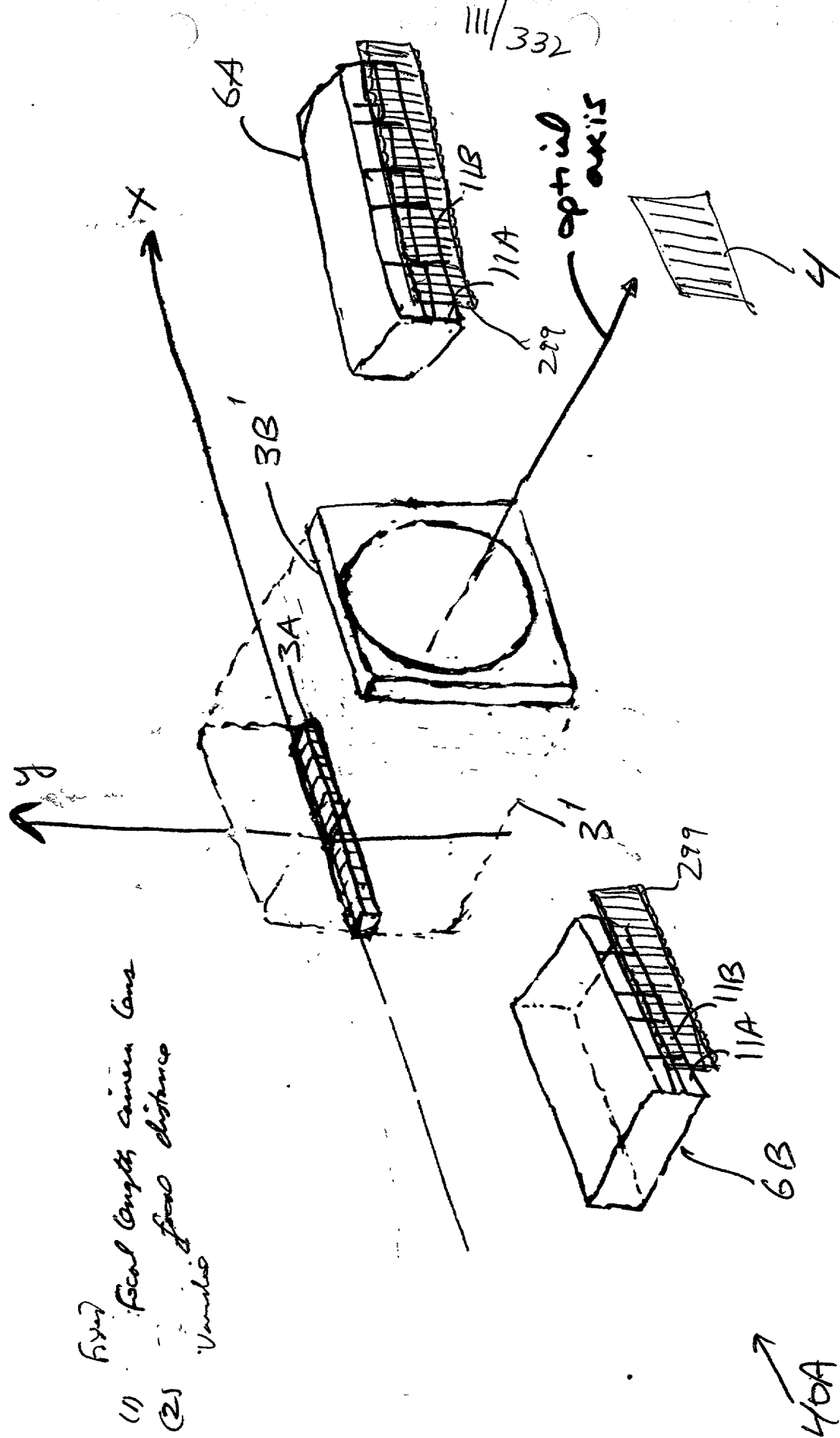


FIG. 2 B1



- Fixed
- (1) focal length, camera lens
  - (2) focal distance
- Variable

FIG. 2B2

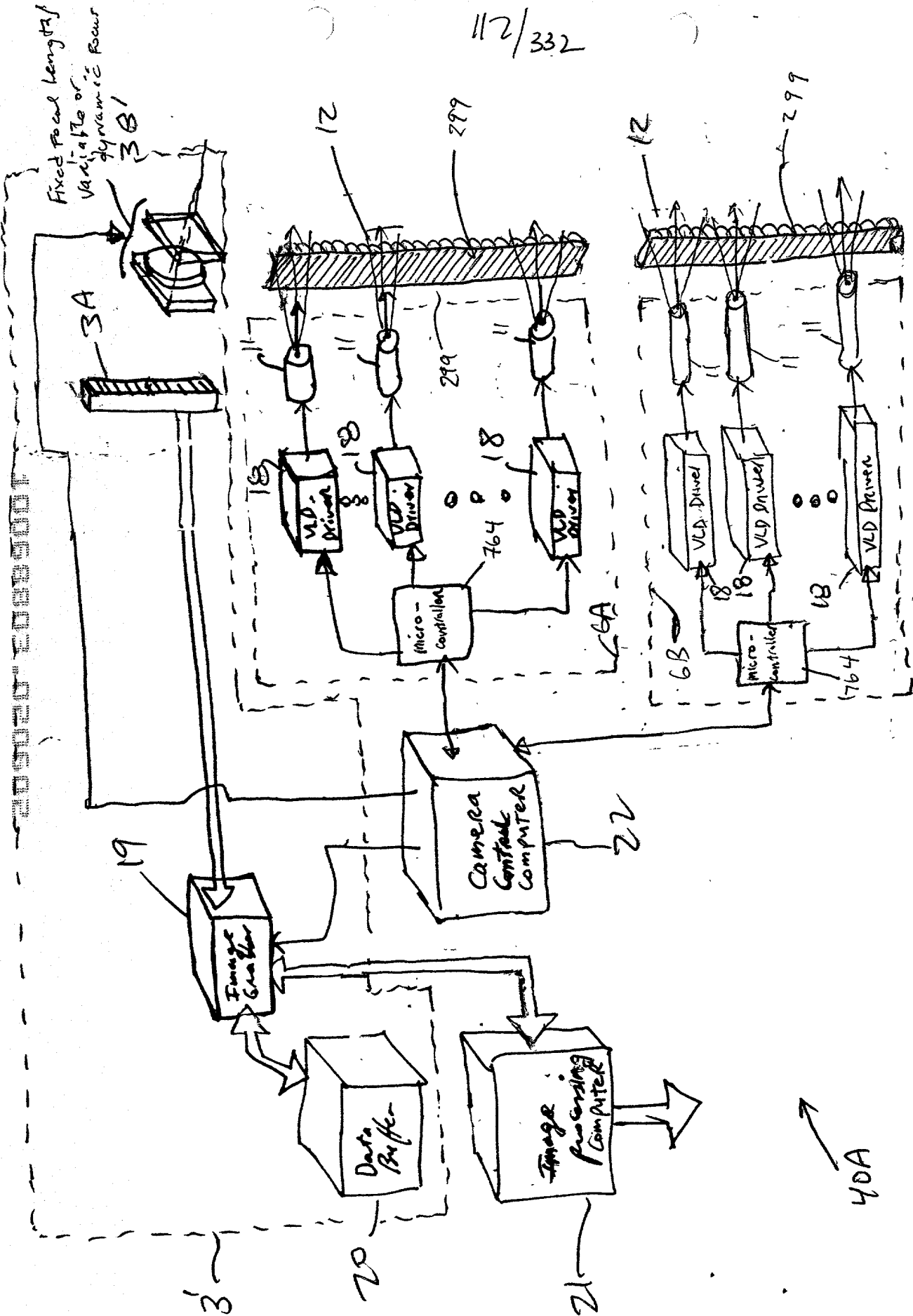


FIG. 2C1

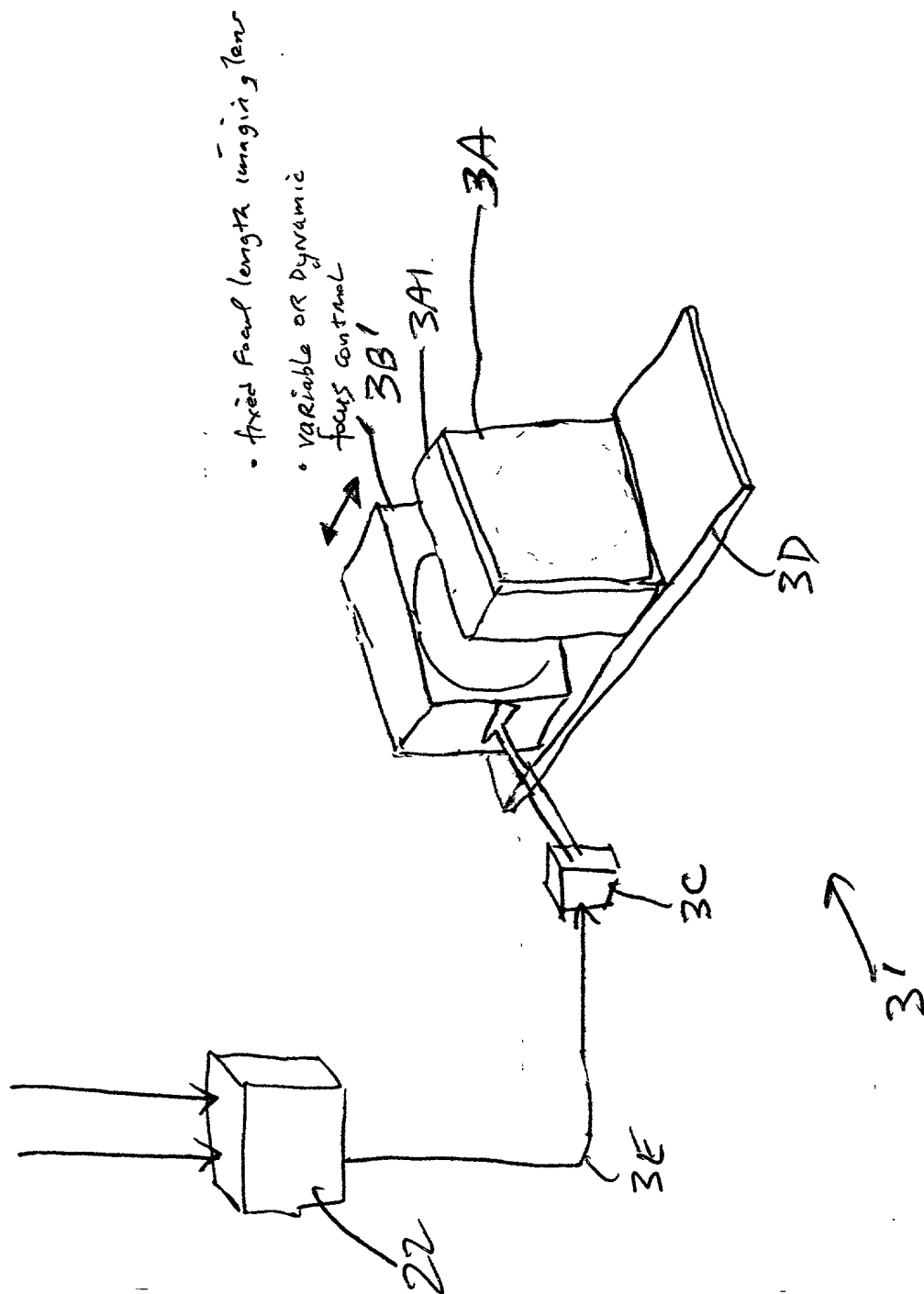


FIG. 2C2

114/332

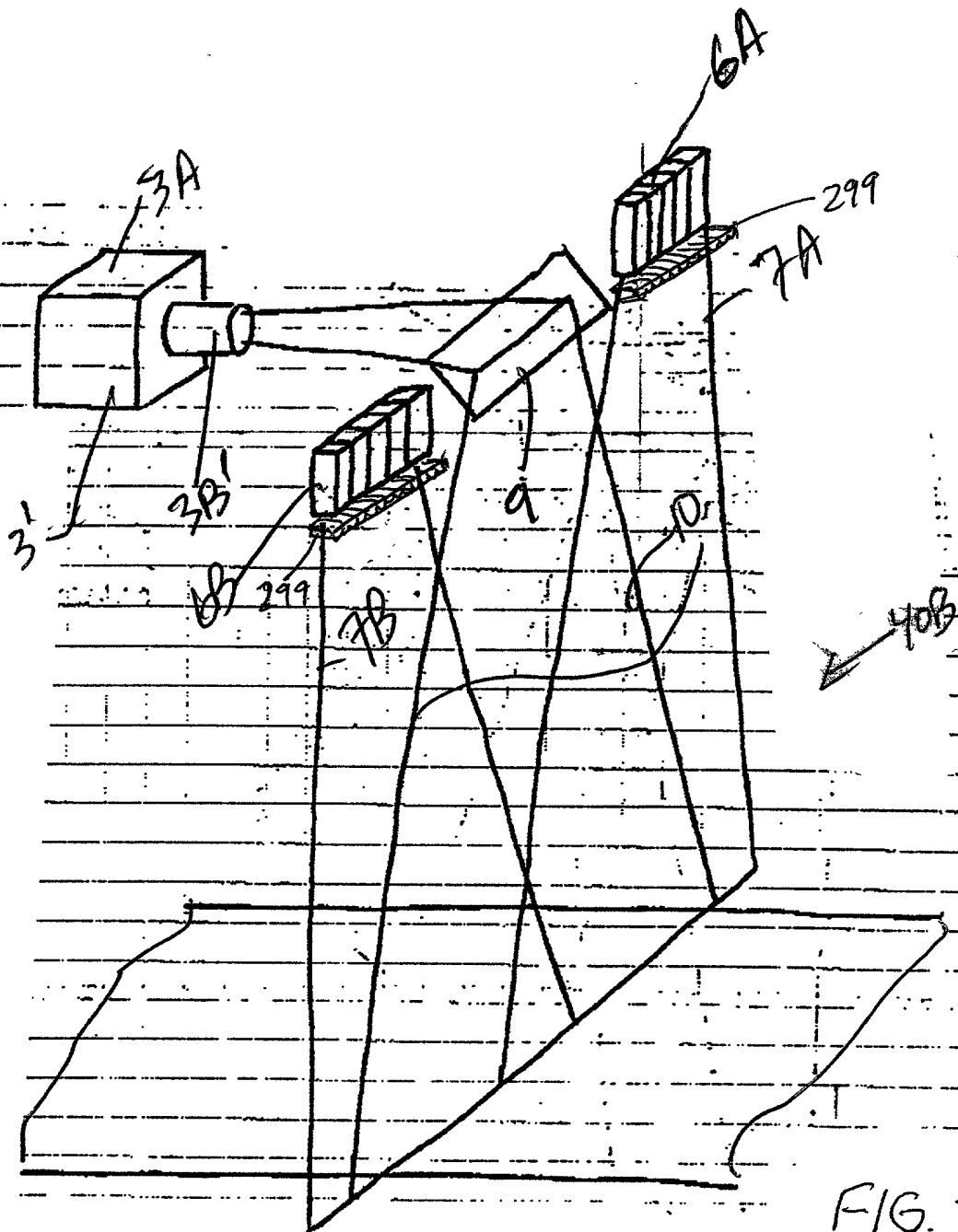


FIG. 2D1



FIG. 2D2

116/332

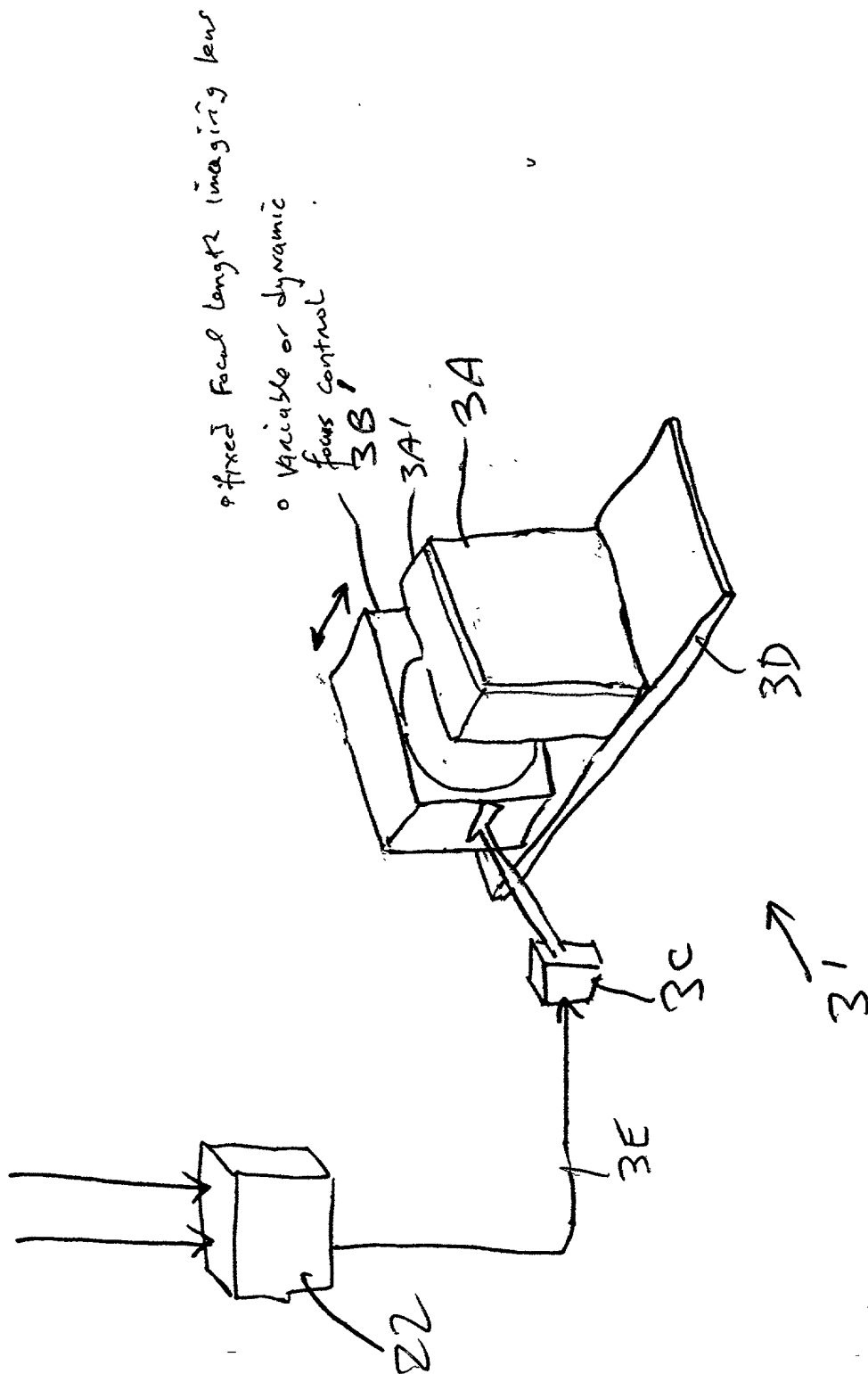


FIG. 2D3

117/332

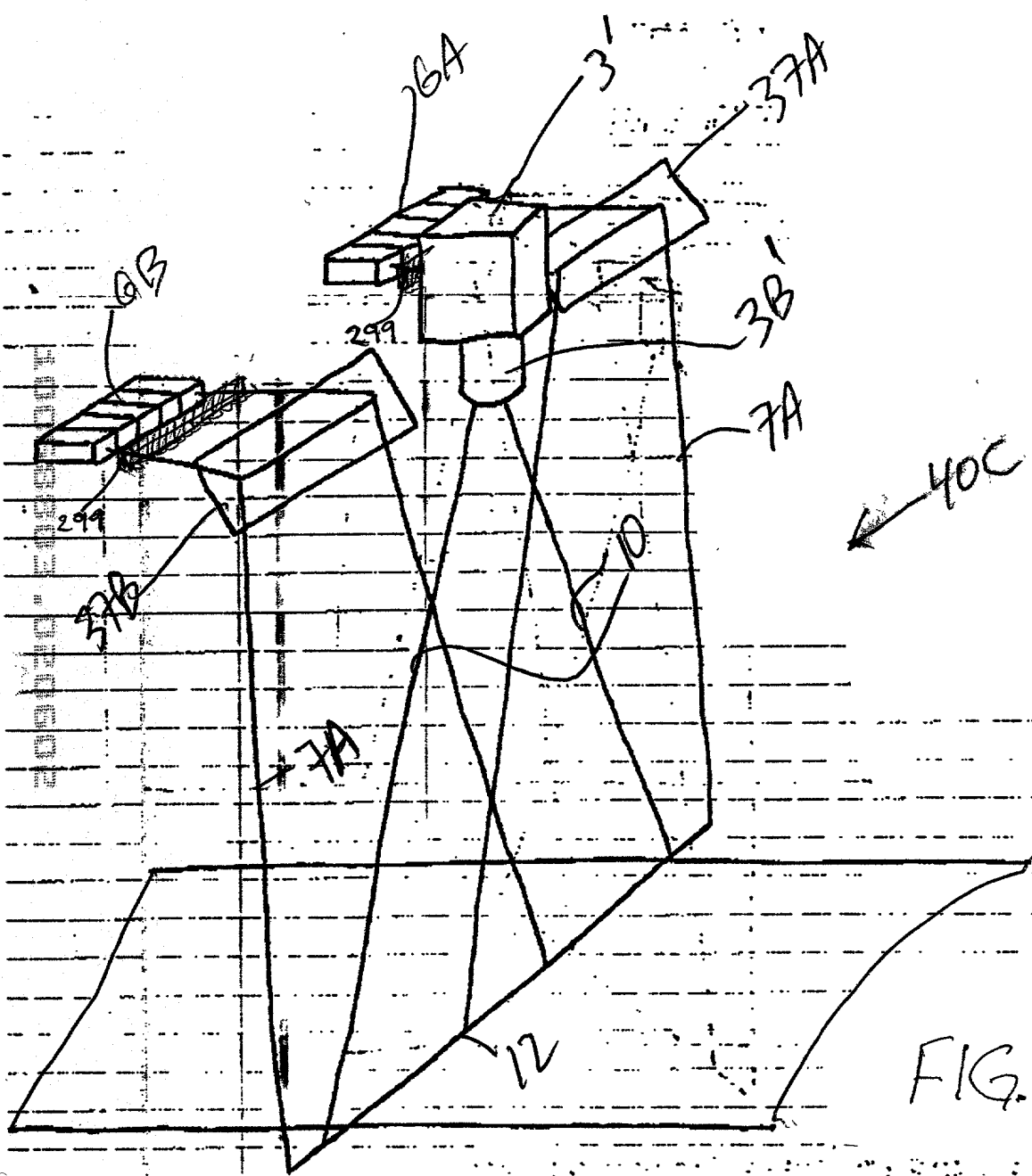


FIG. 2E1



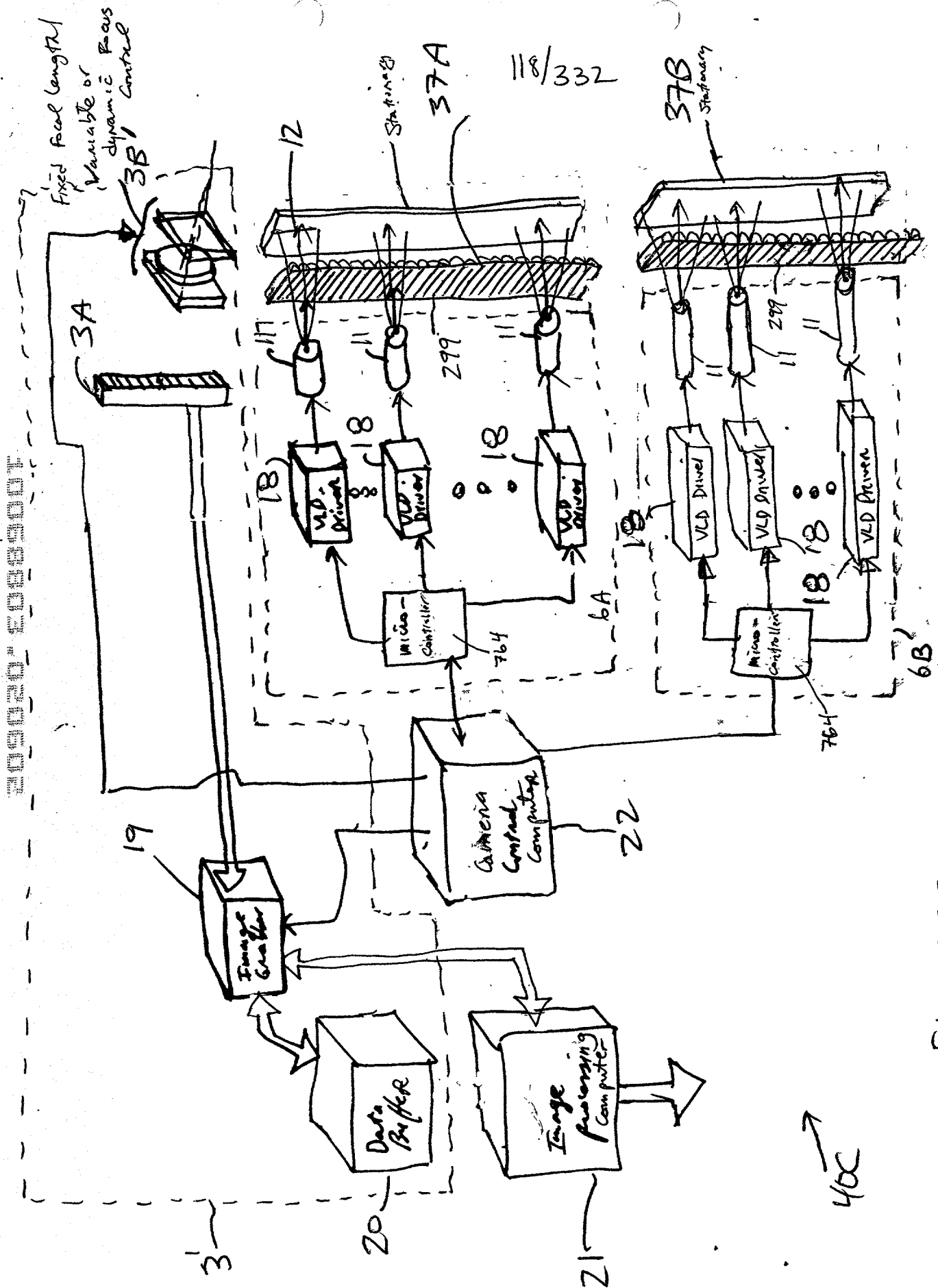


Fig. 2E2

209820-00889001

119/332

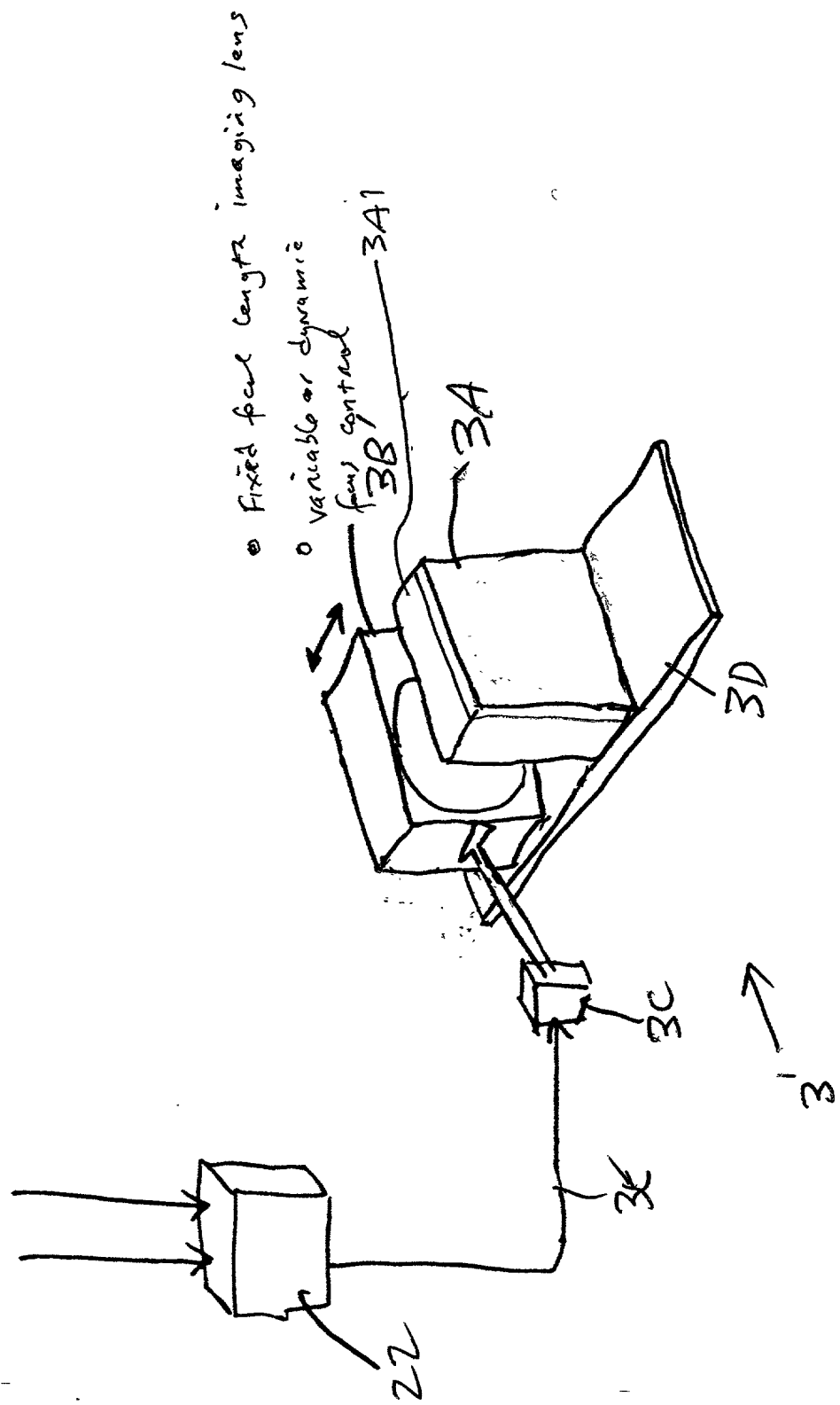


FIG. 2E3

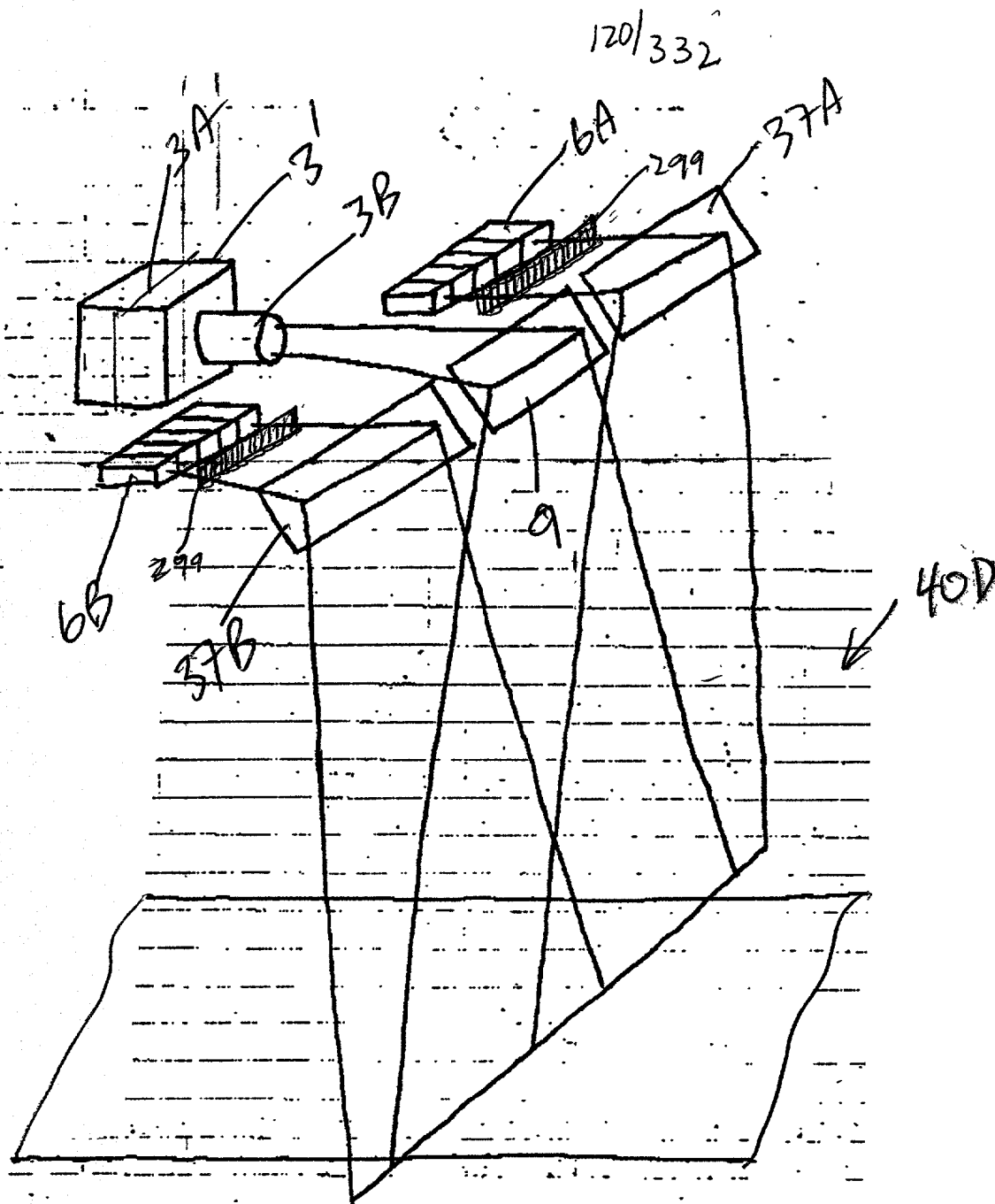


FIG. 2F1

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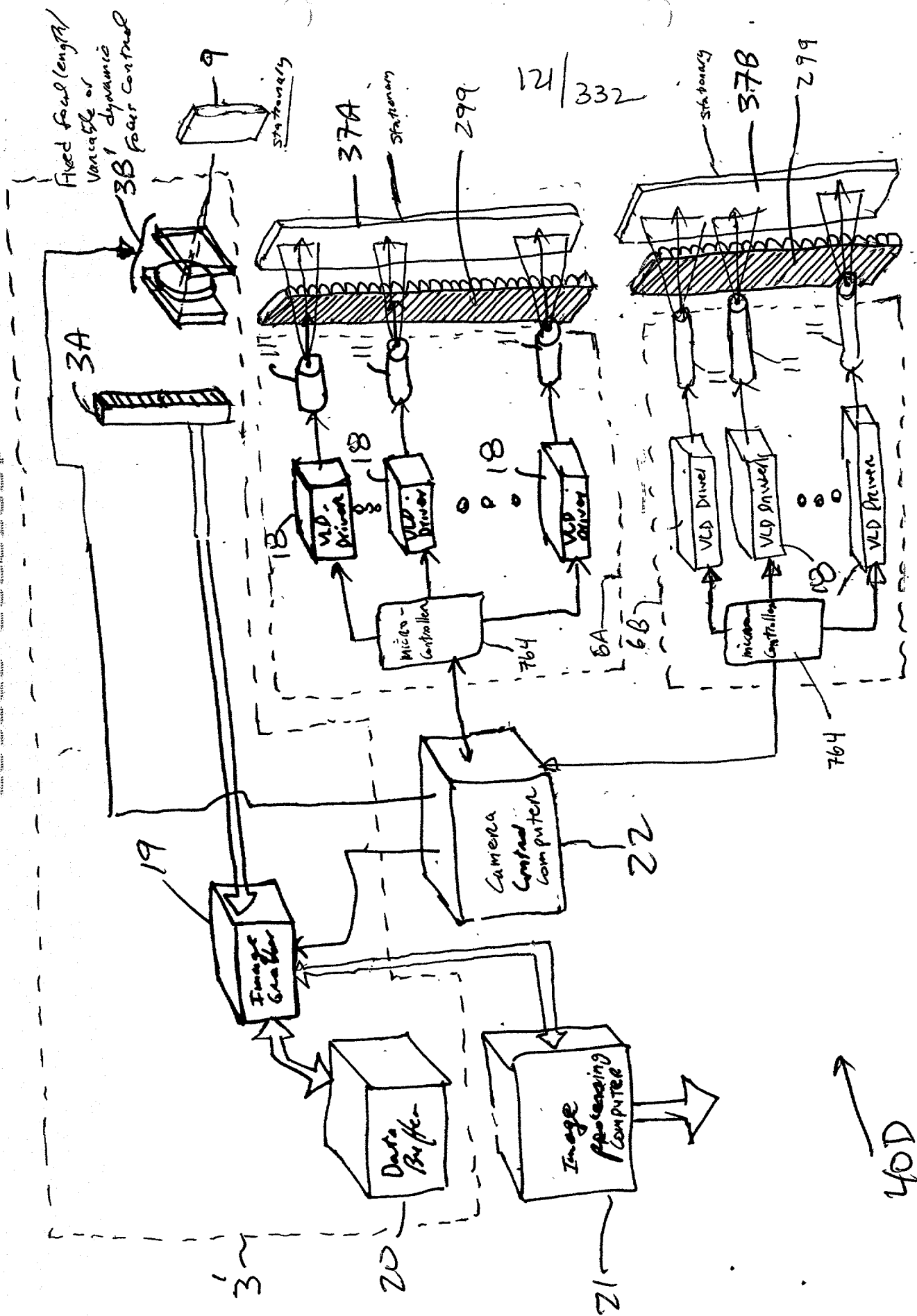


FIG 2FZ



123/332

10058803-020602

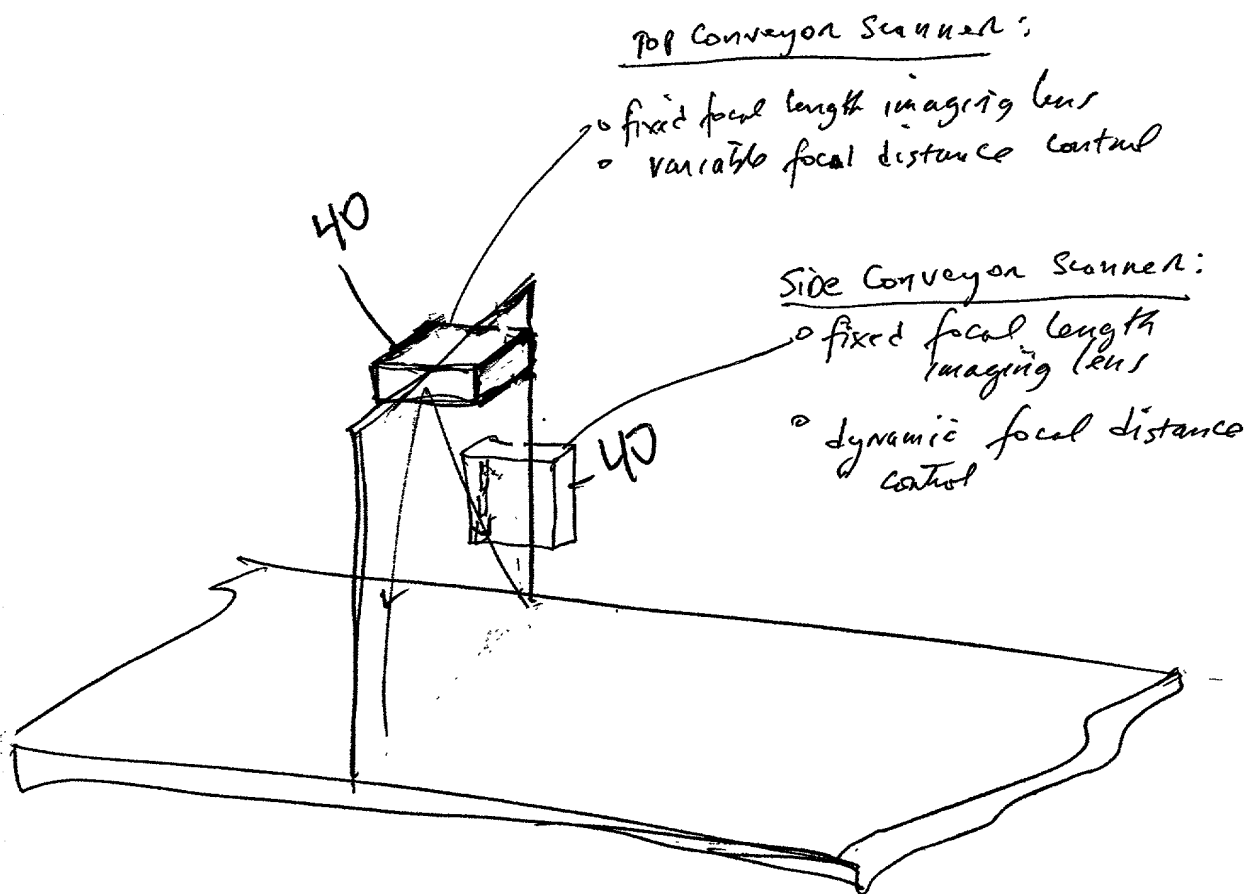
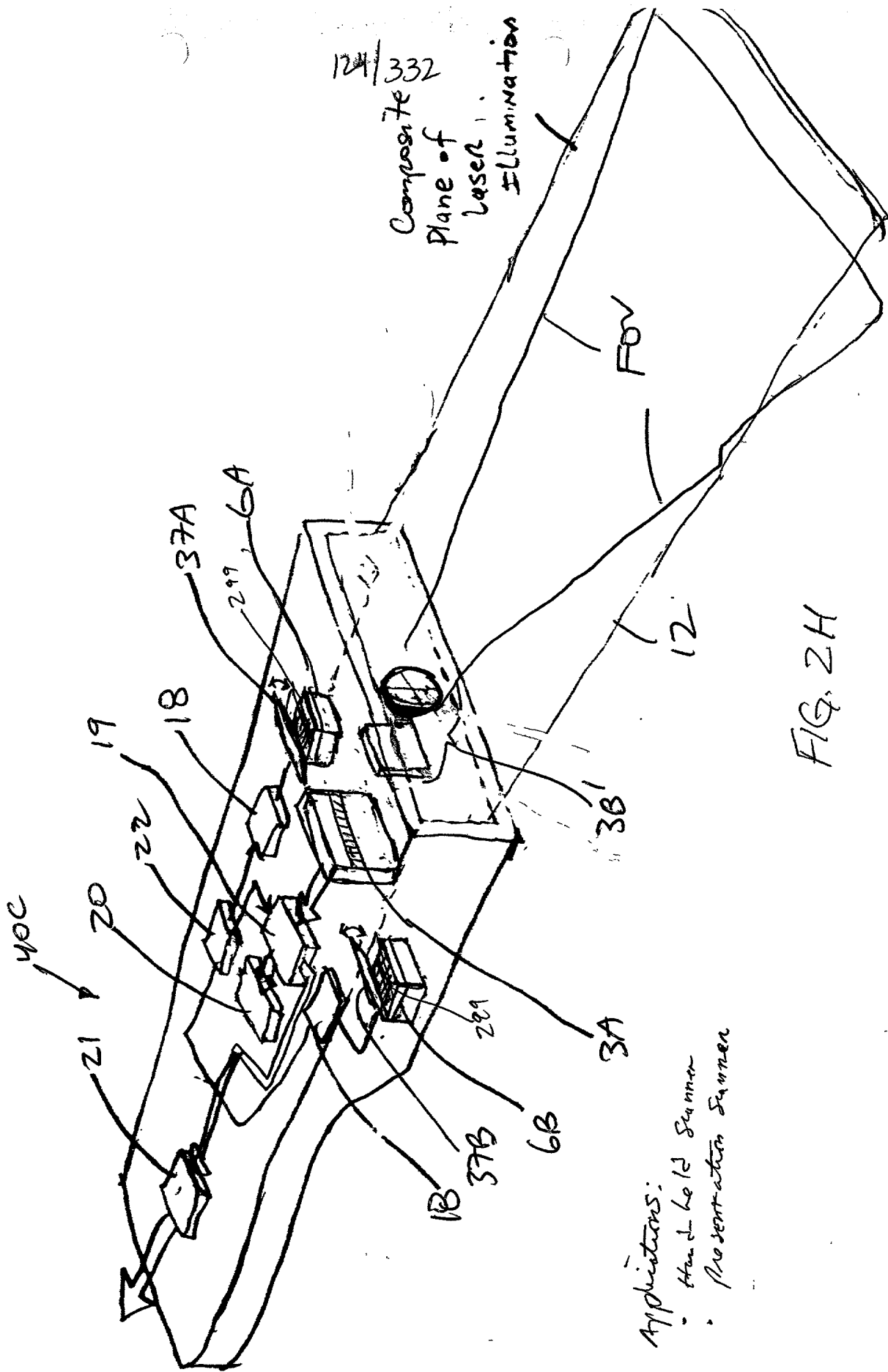


FIG. 2G



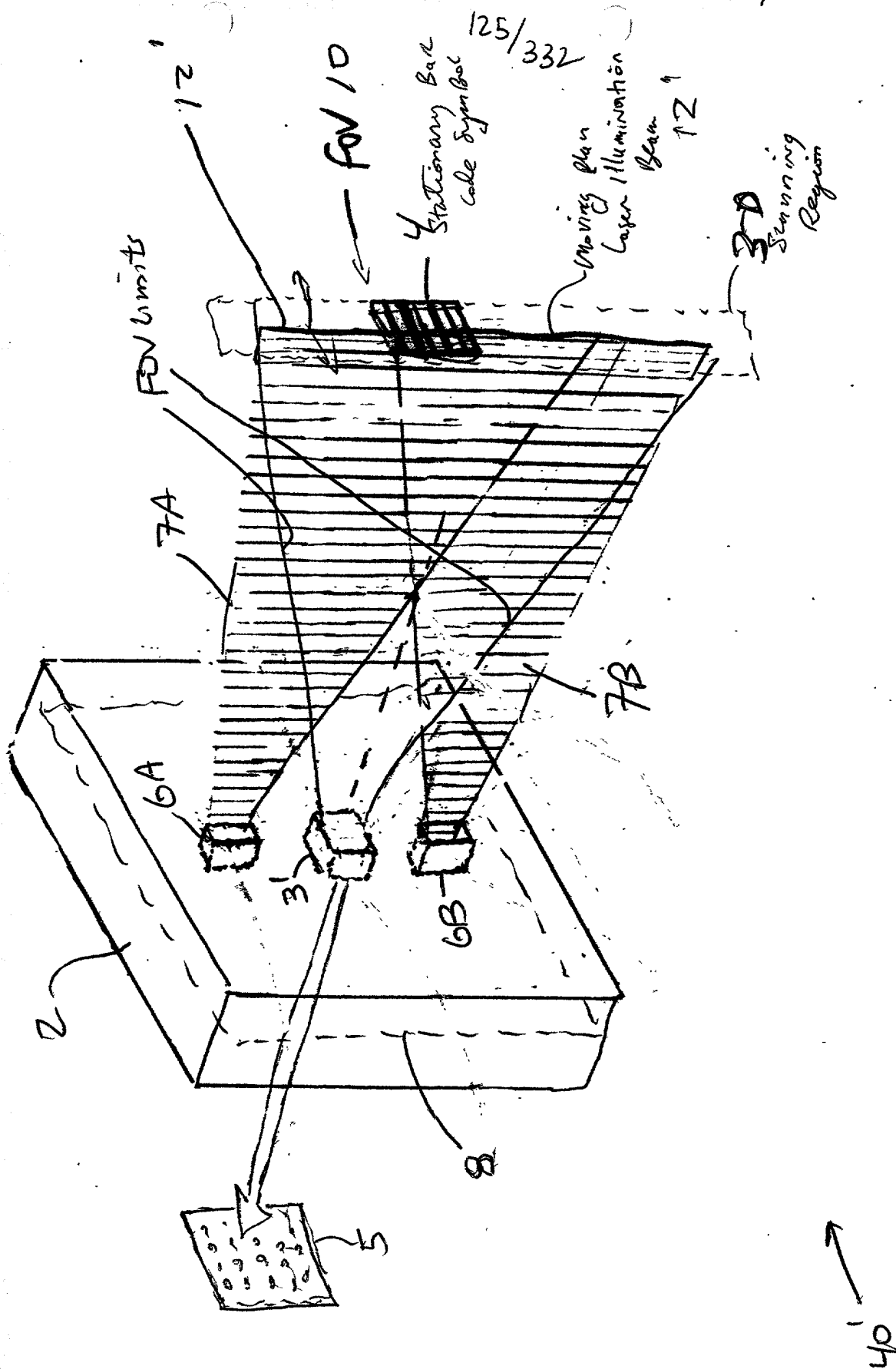
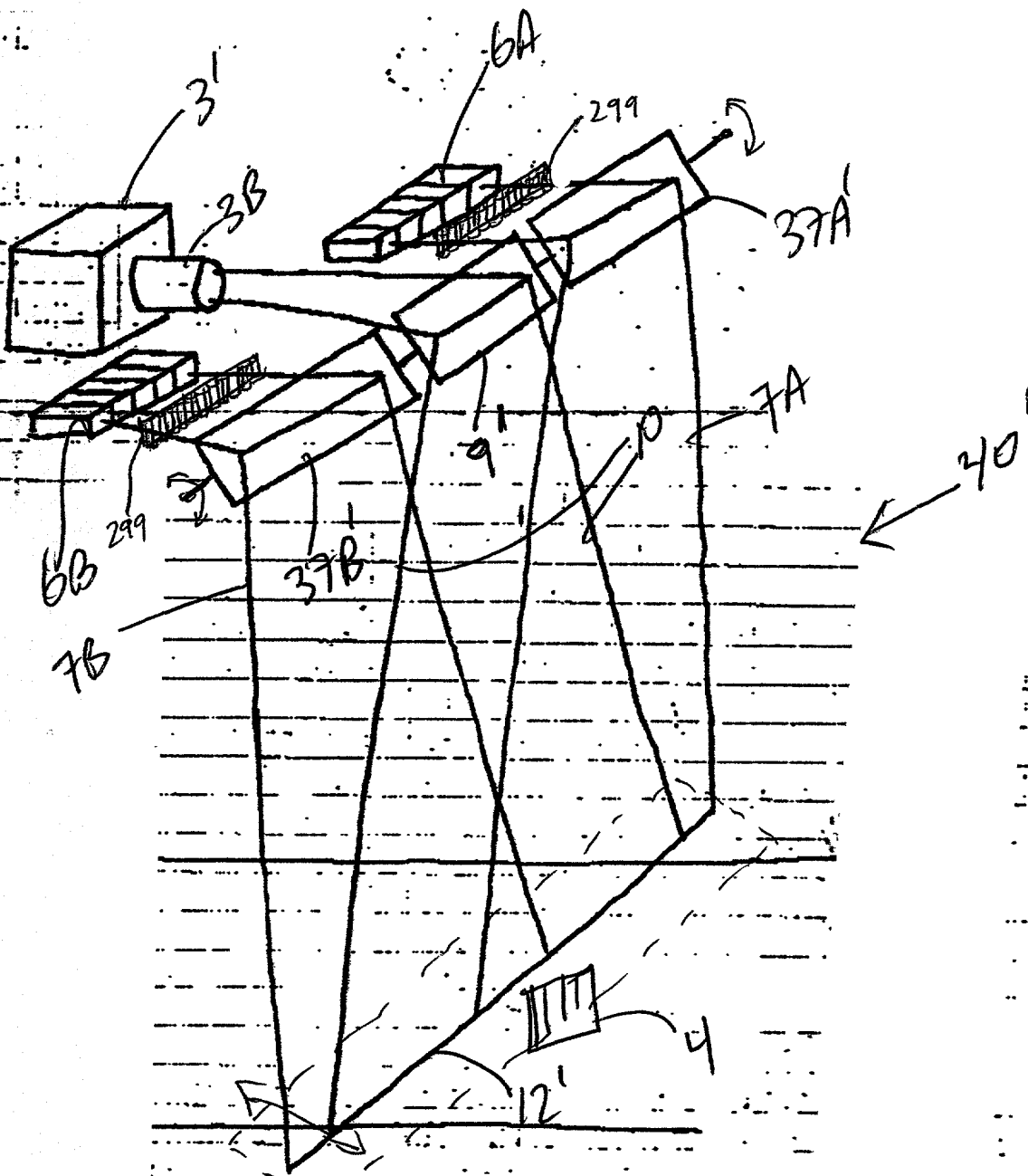


FIG. 2II





3-D  
Scanning  
Region

FIG 2I Z

209020-00339003

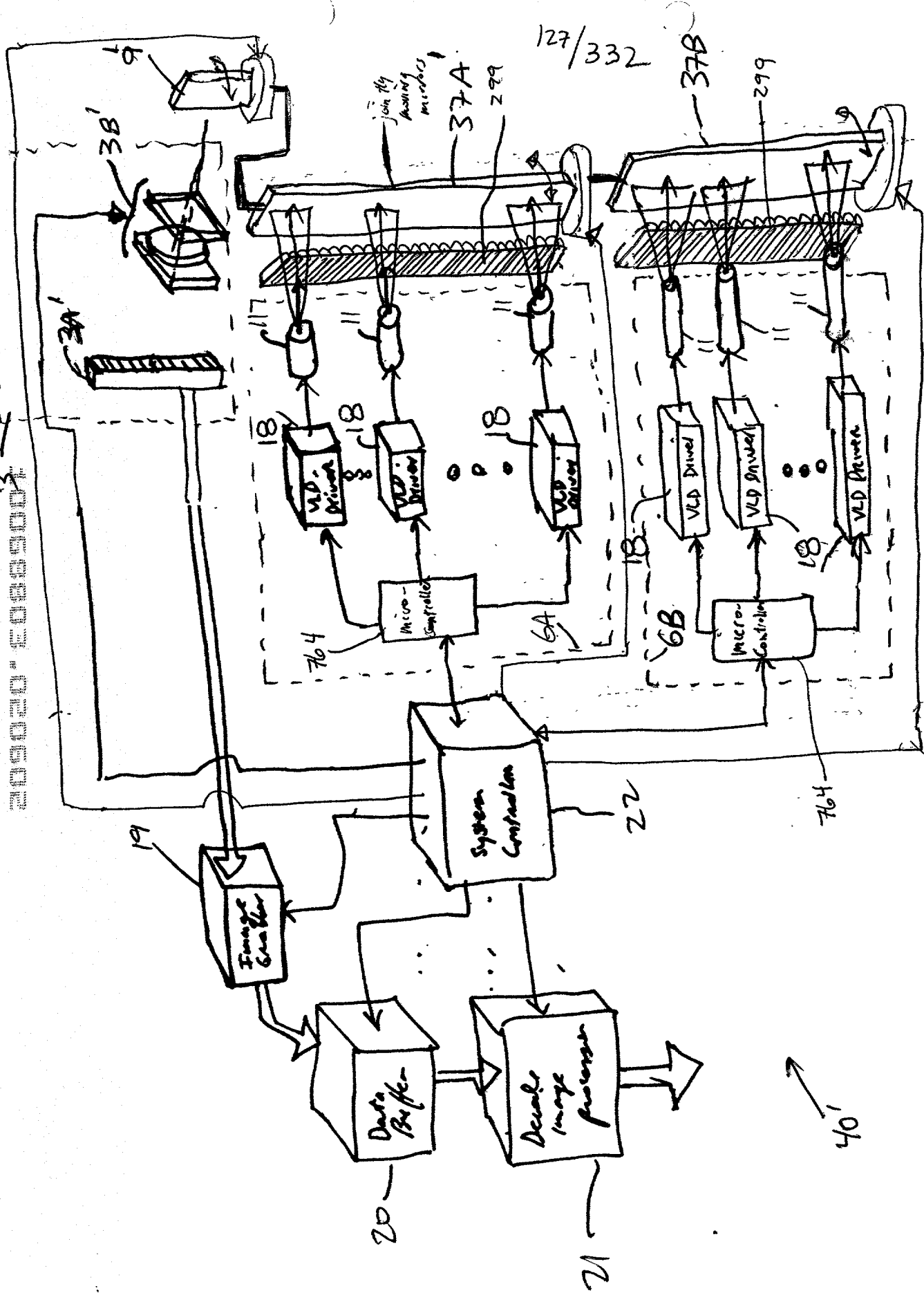


FIG. 2I3

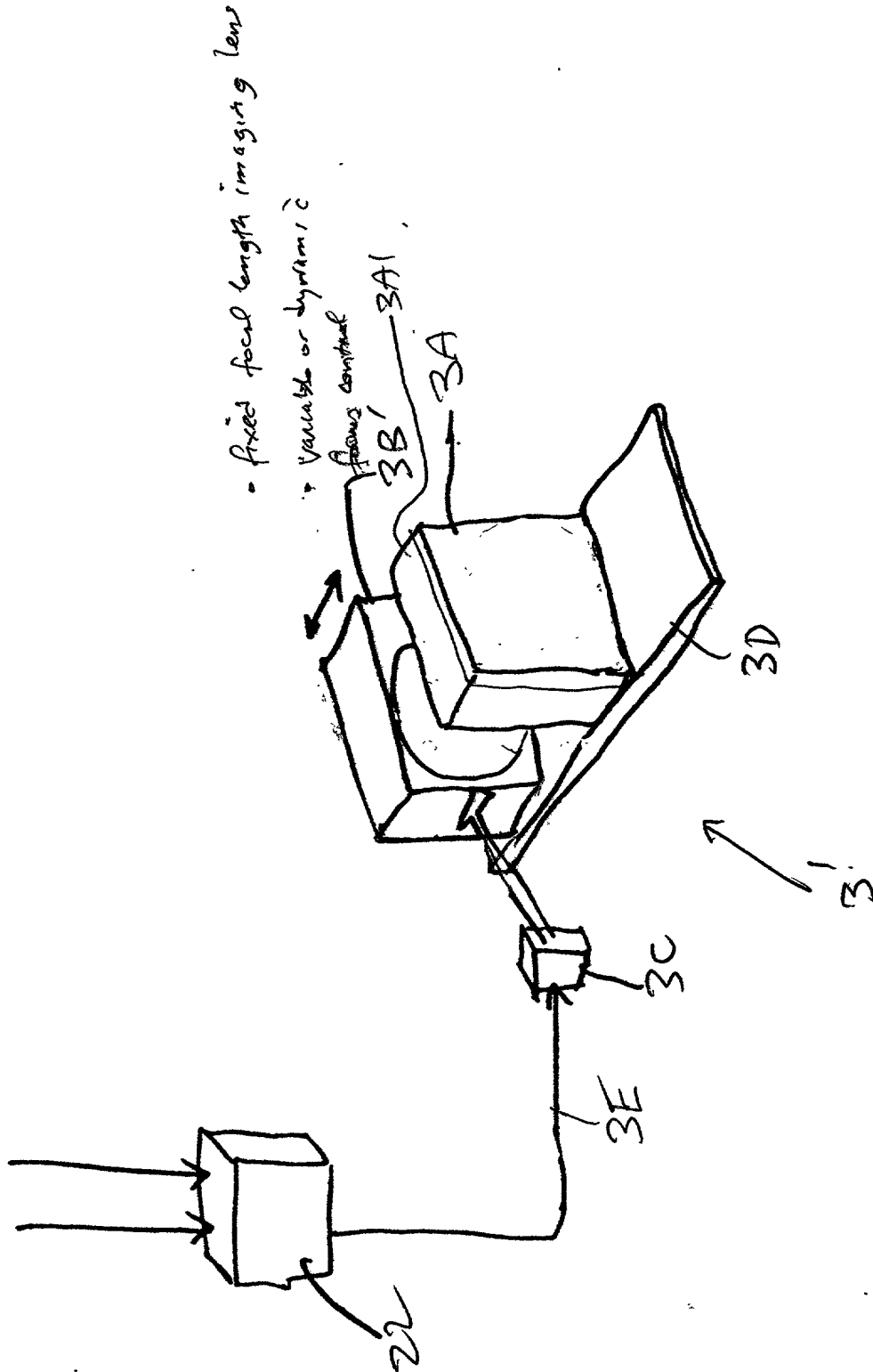
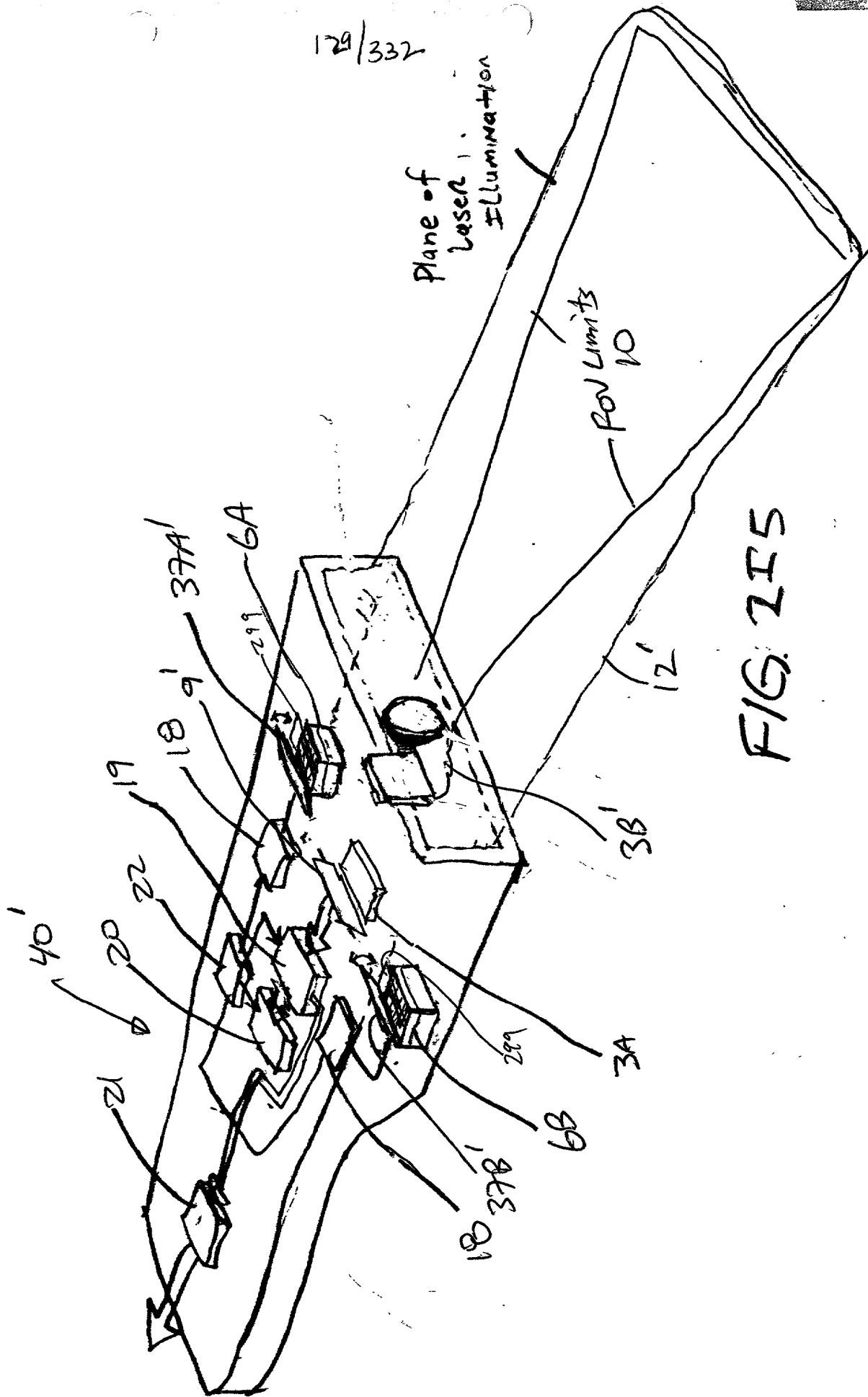


FIG. 2I4



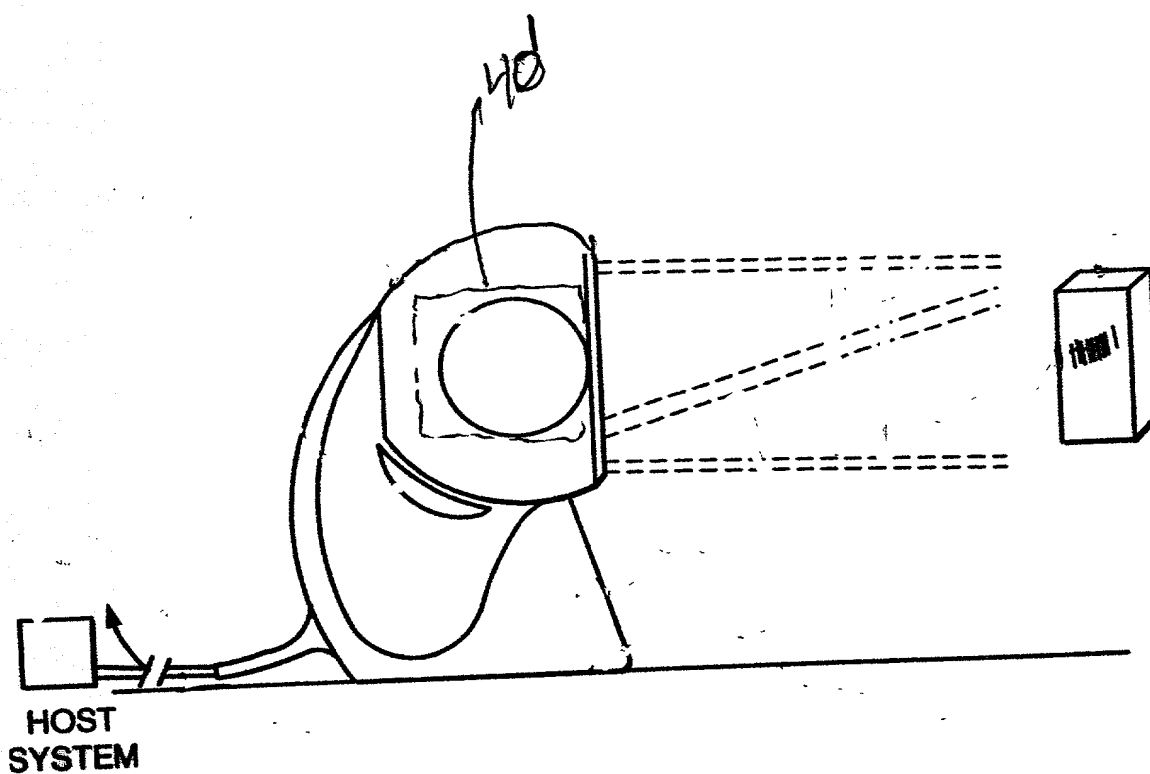


FIG. 2I6

209028' 0088900T

131/332

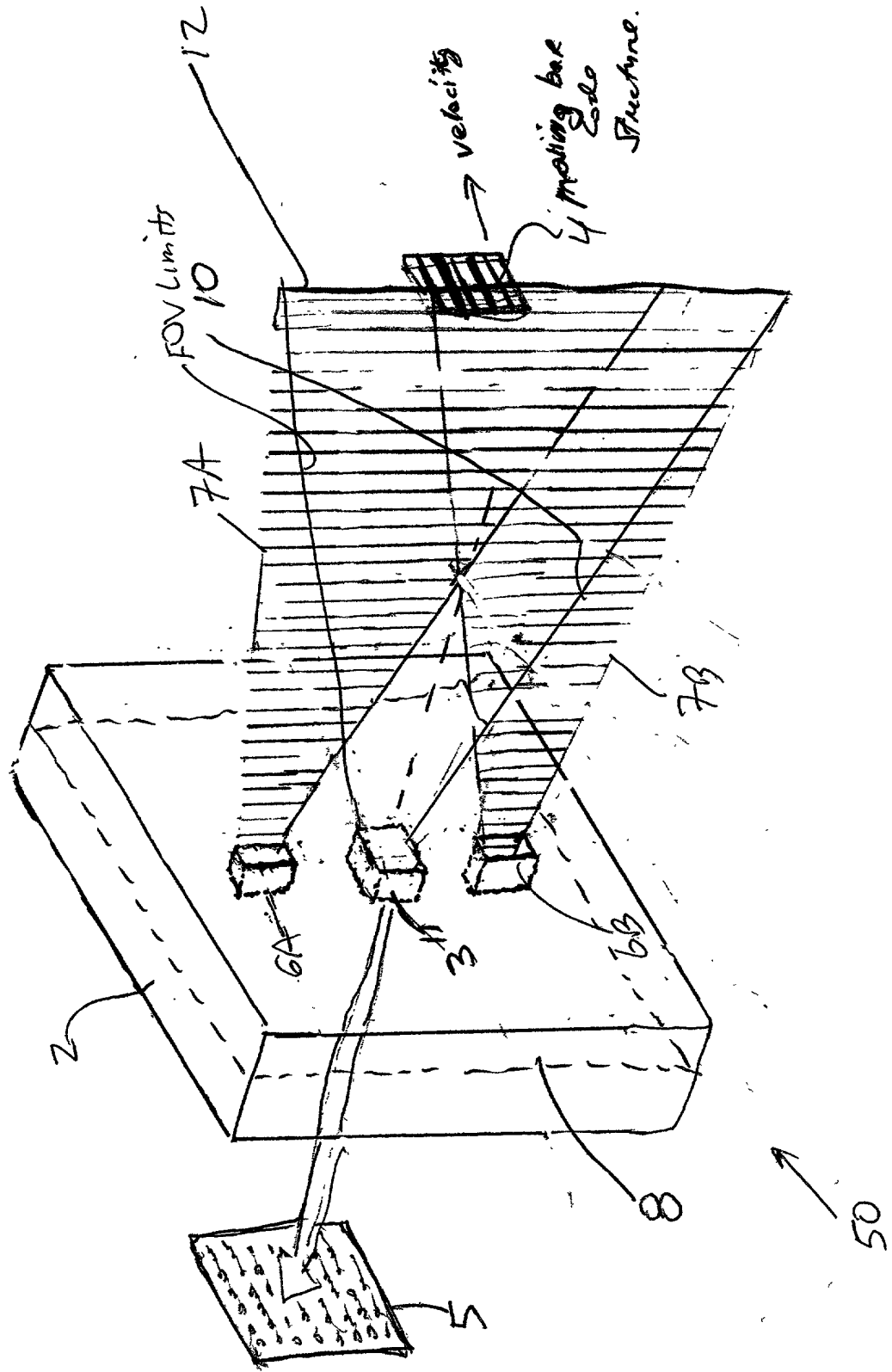


FIG 3A

132/332

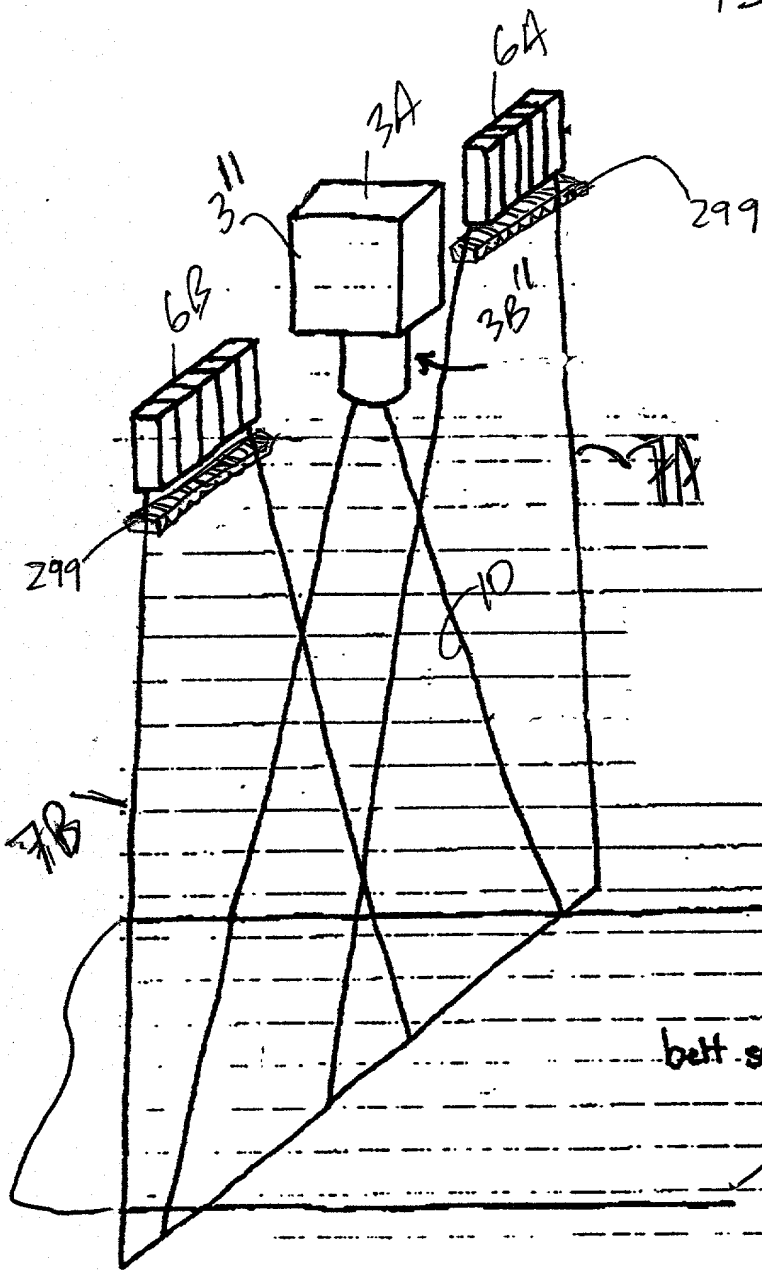


FIG. 3B1

133/332

Module housing

3A

3A'

3B1

3B2

6A

299 optical axis

4

6B

299

(1) Variable focal length camera lens  
(2) Variable focus distance

FIG. 382



134/332

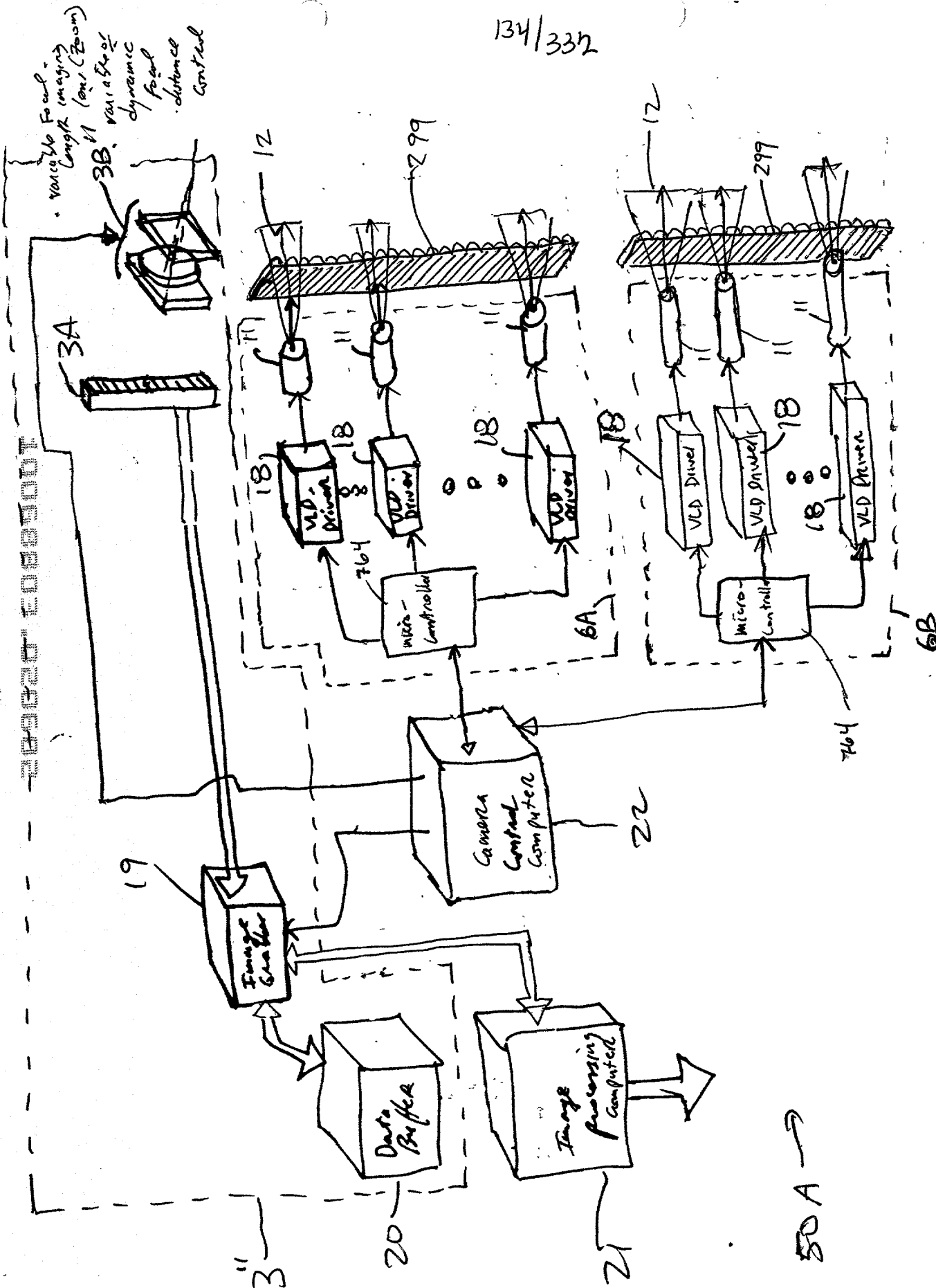


FIG 3C1

50A →

- Variable focal lengths camera lens
- Variable focal distance

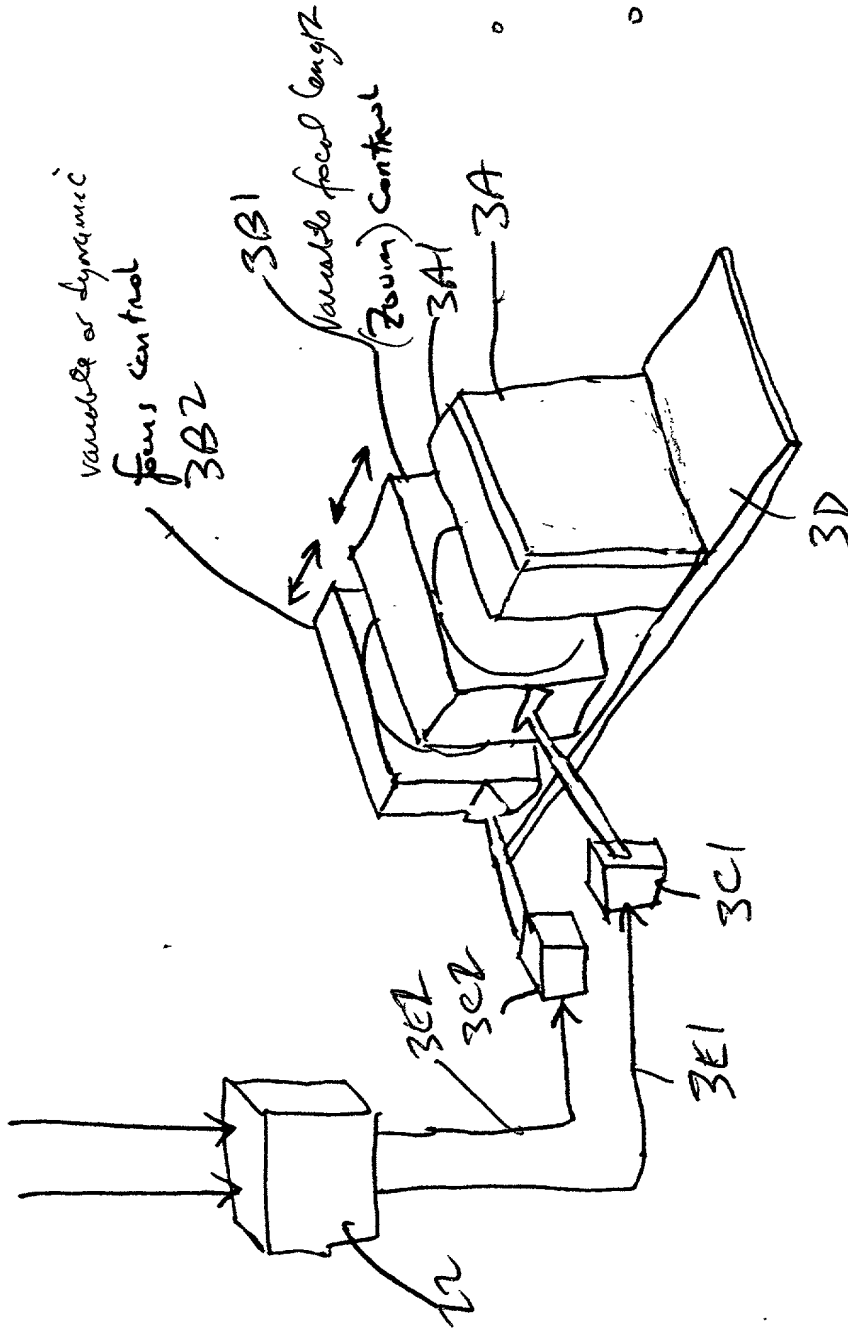


FIG. 3CZ

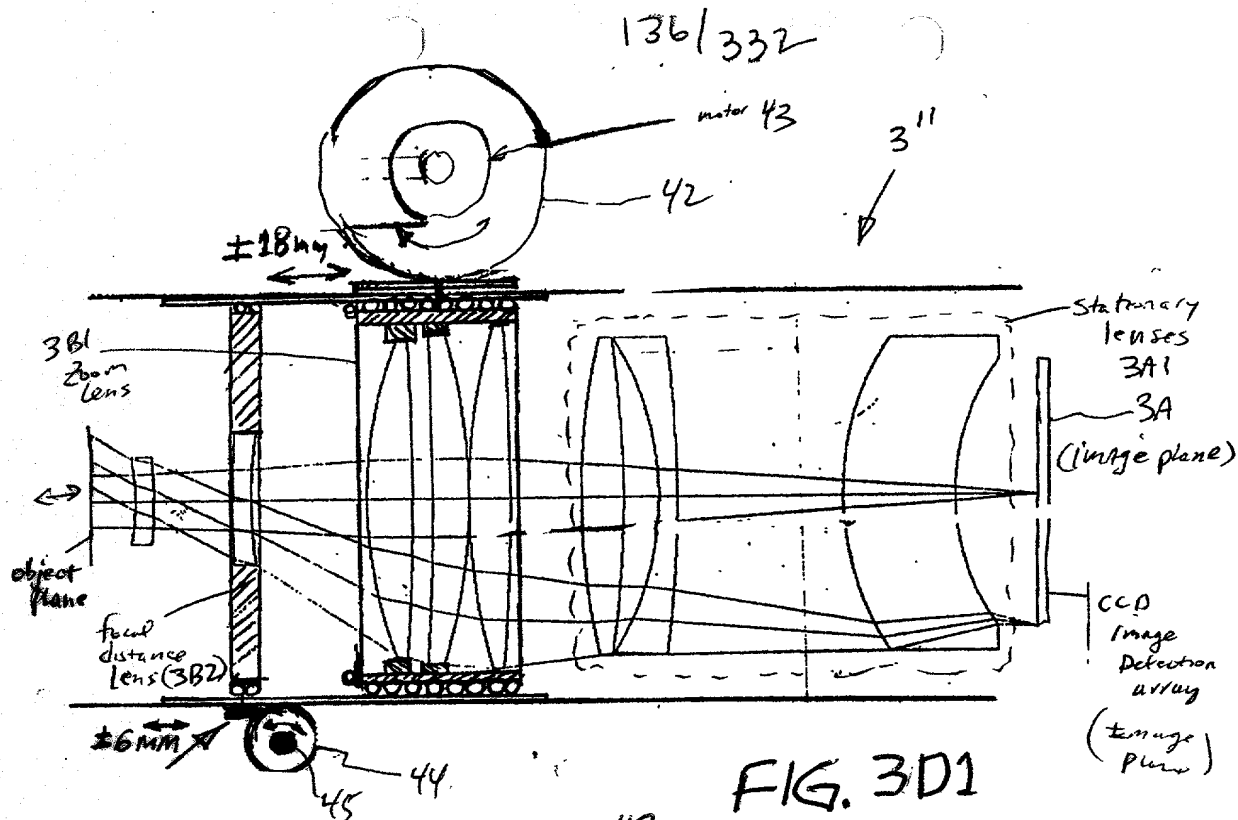


FIG. 3D1

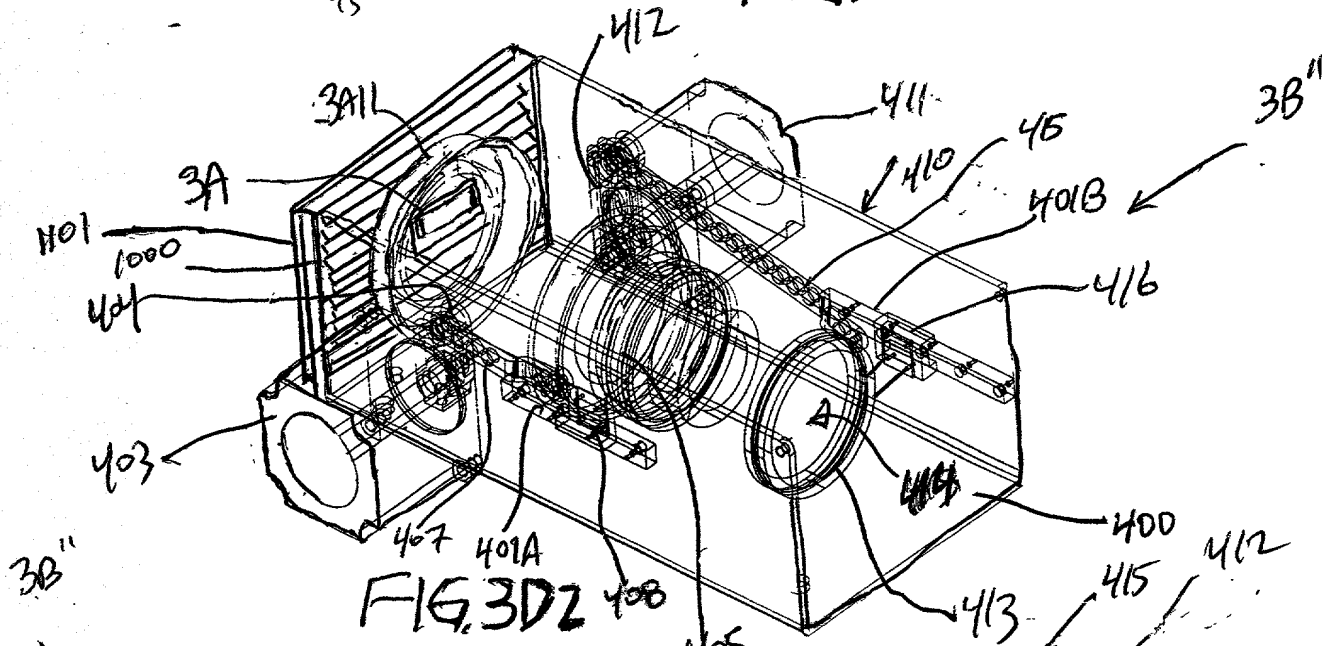


FIG. 3D2

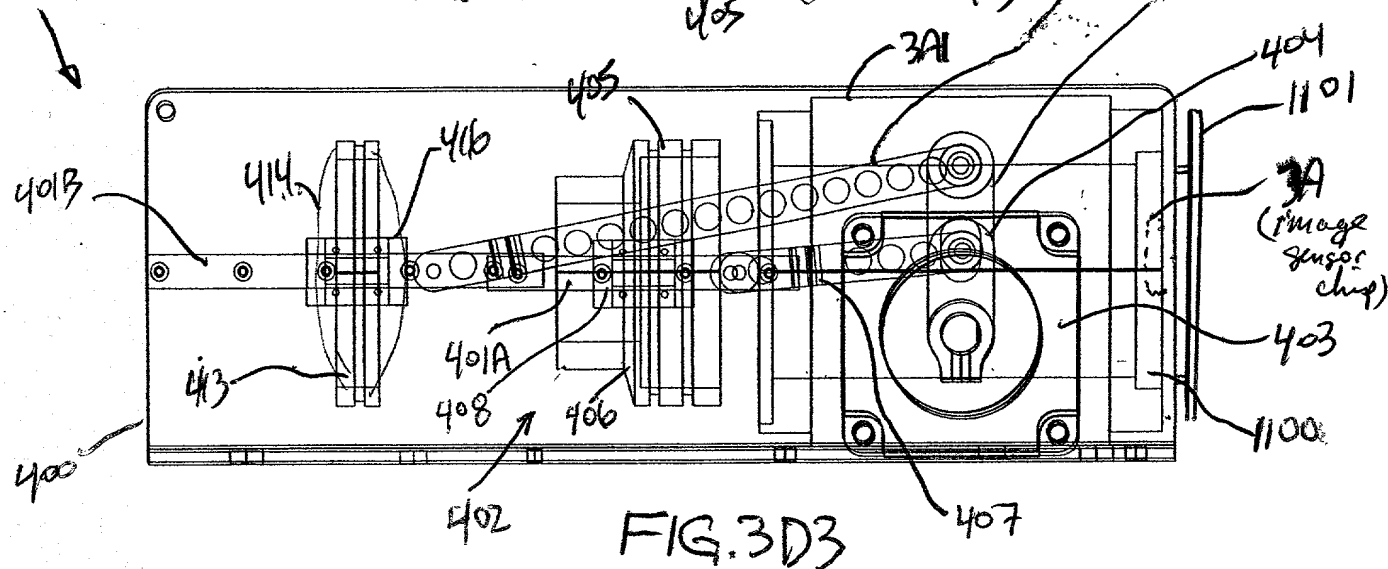


FIG. 3D3

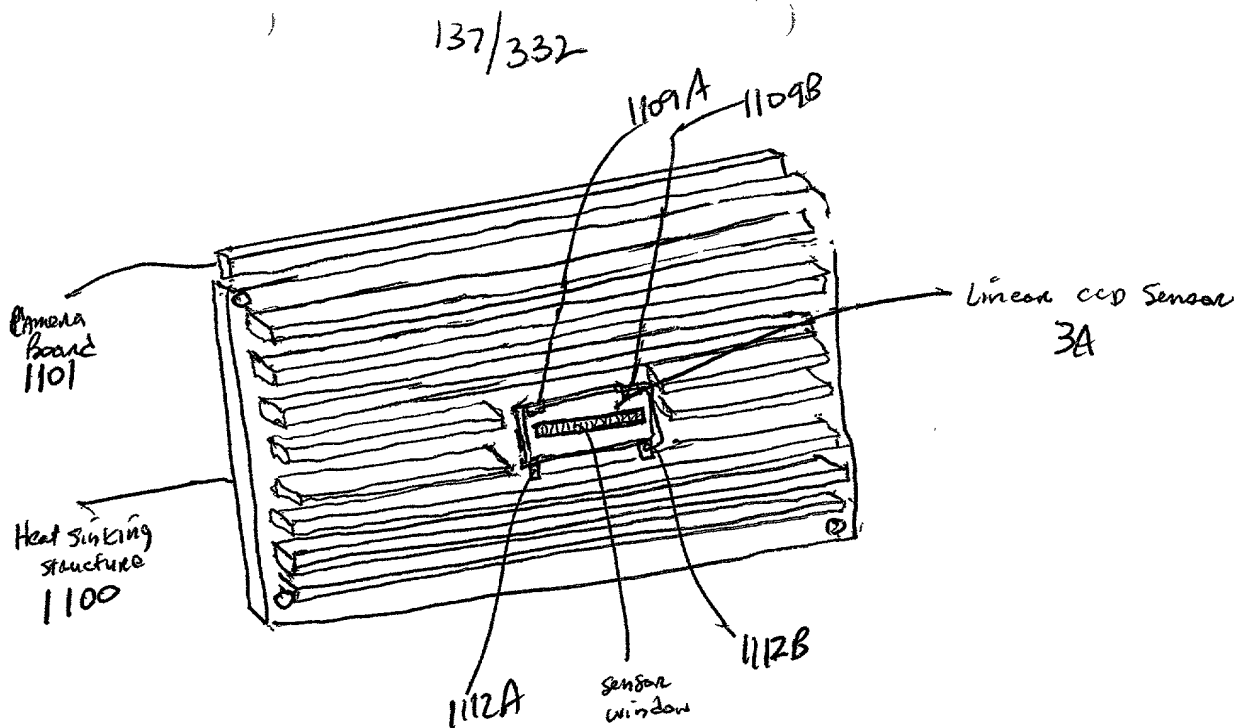


FIG. 3D4

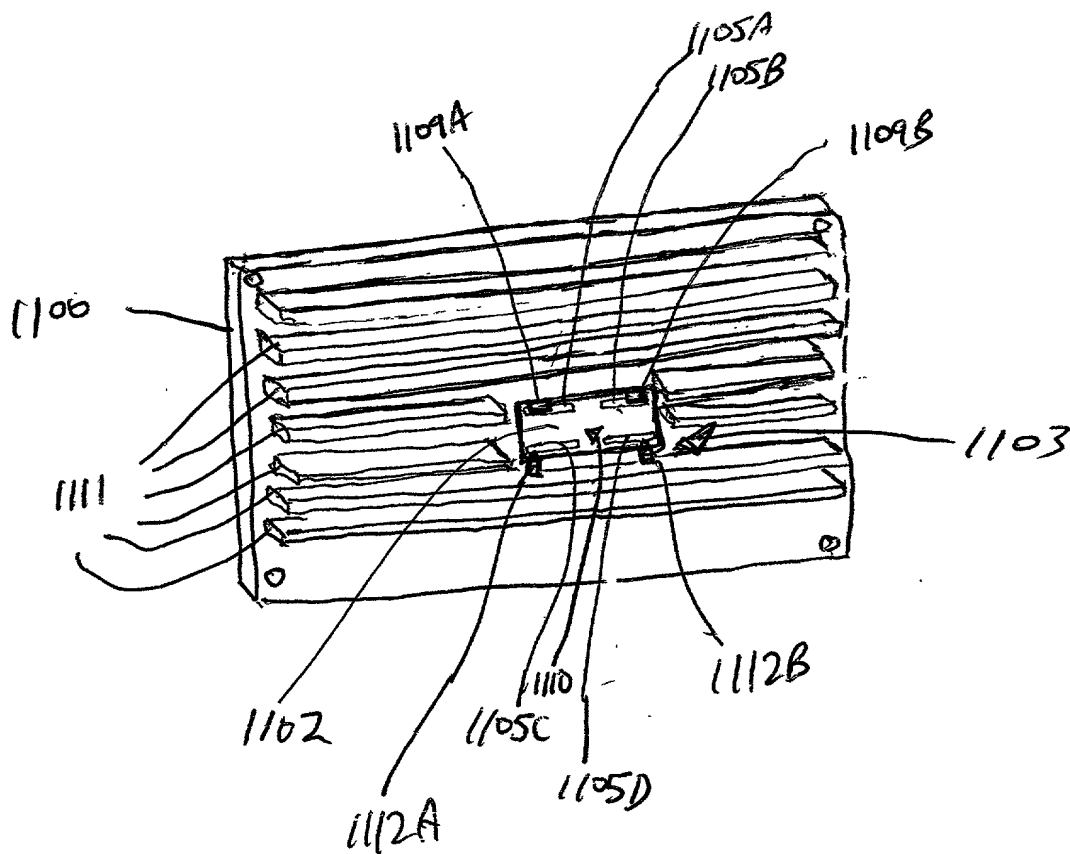


FIG. 3D5

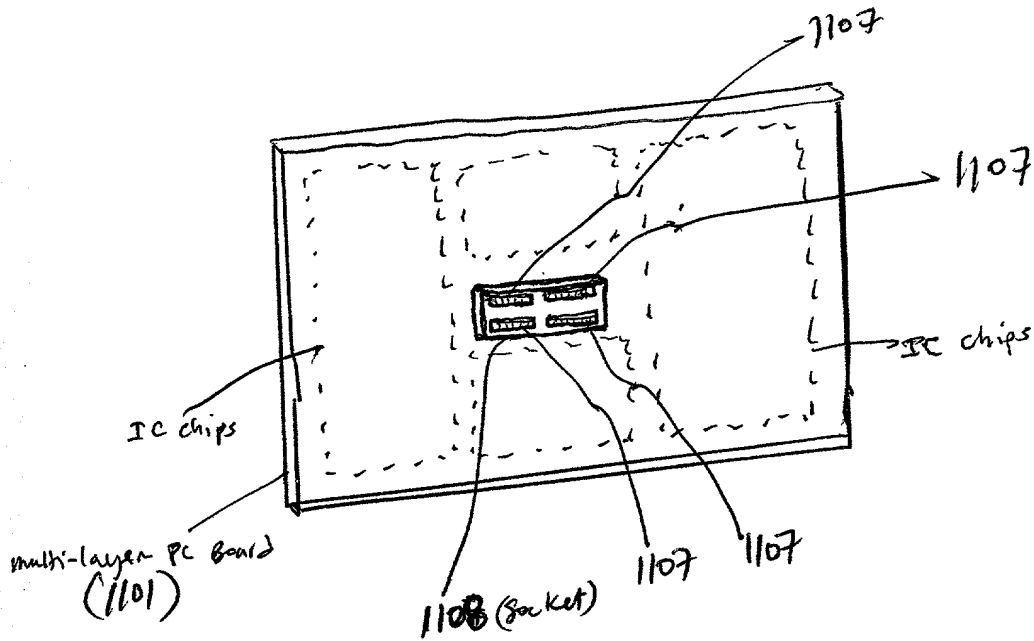


FIG. 3D6

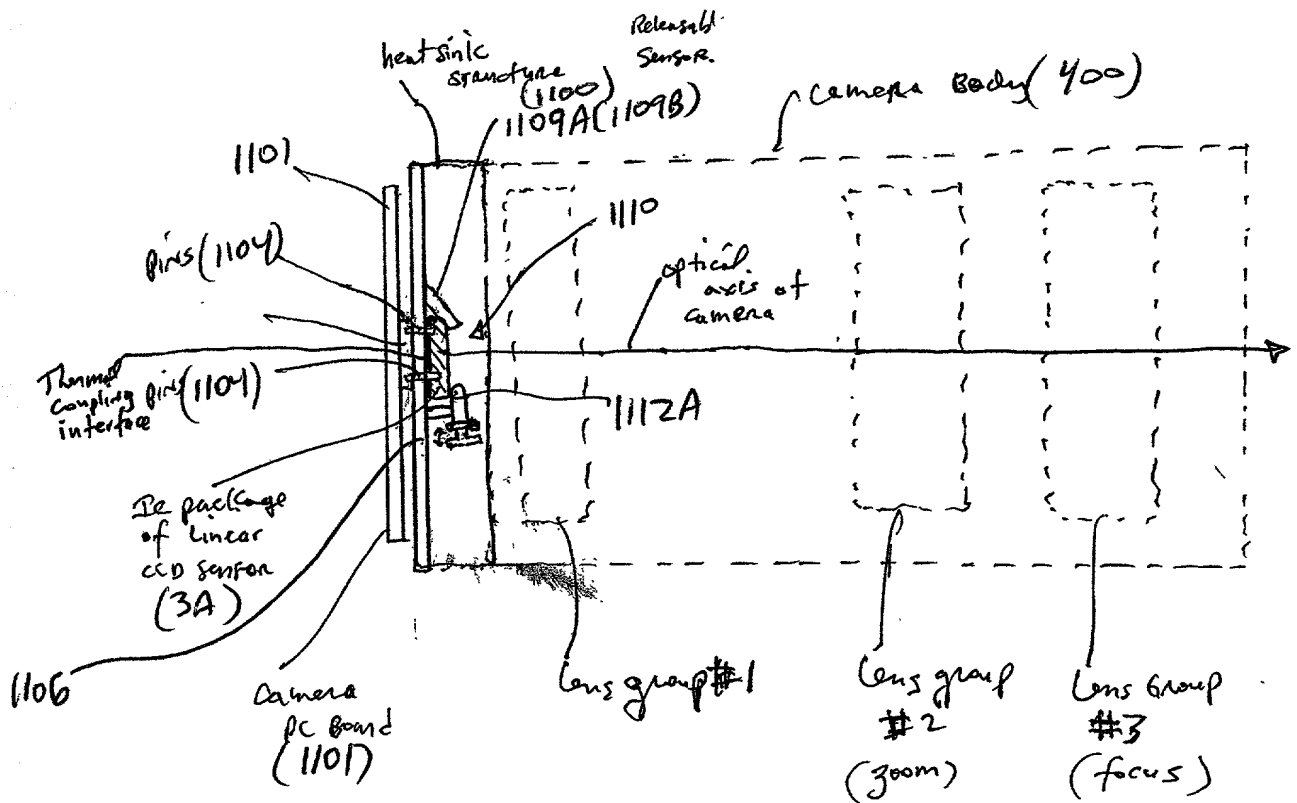


FIG. 3D7

139/332

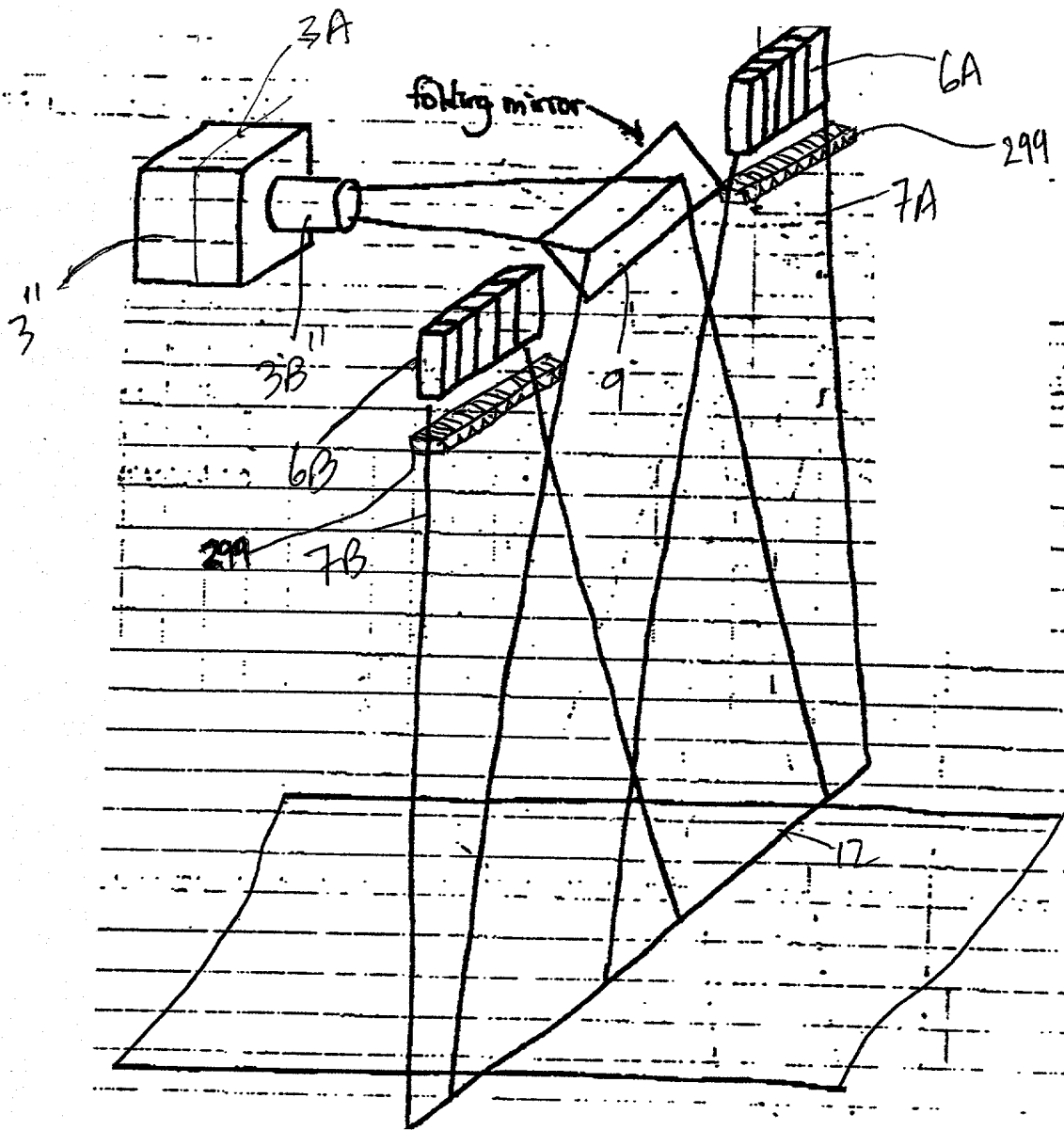


FIG. 3E1

140/332

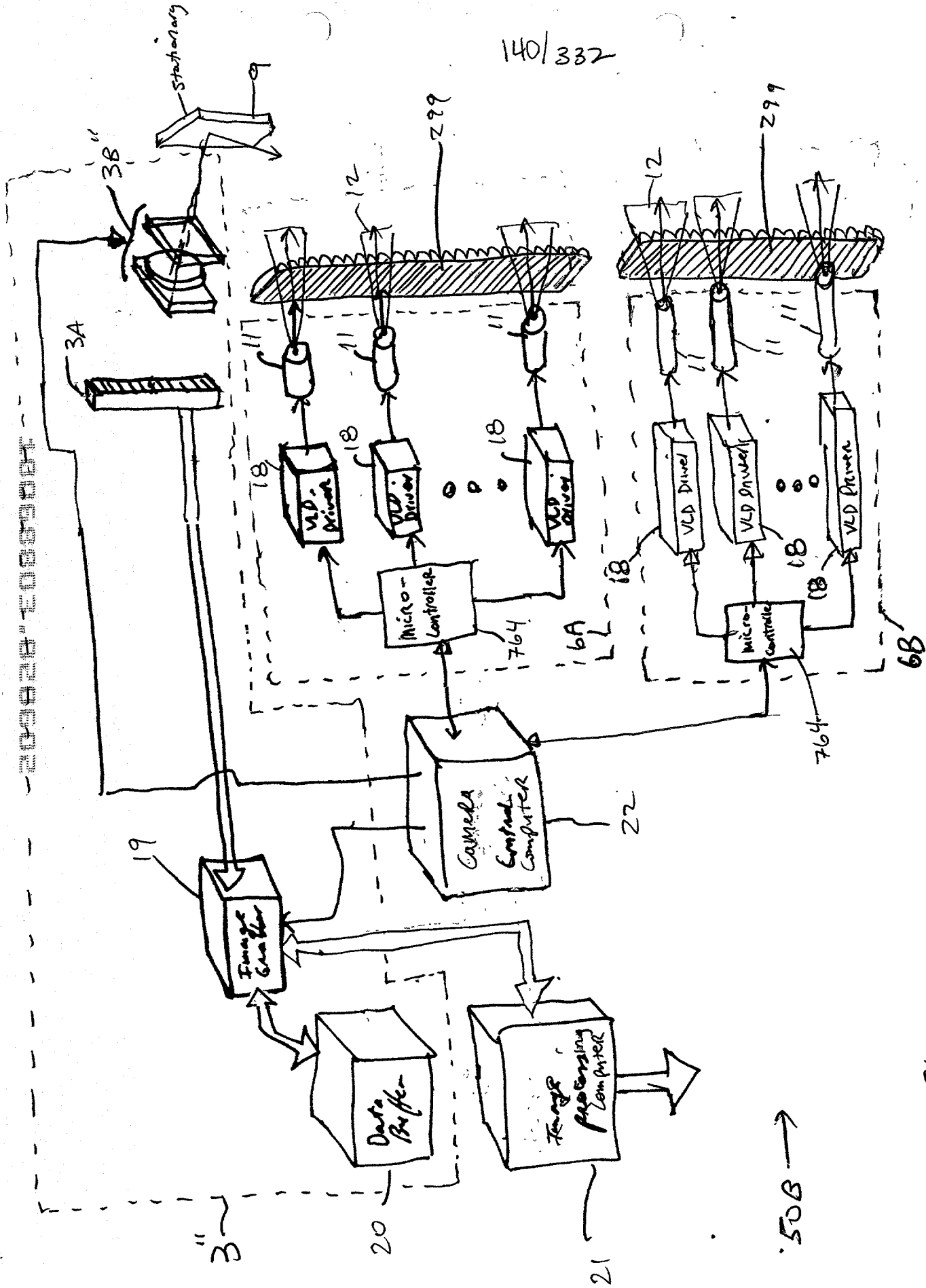


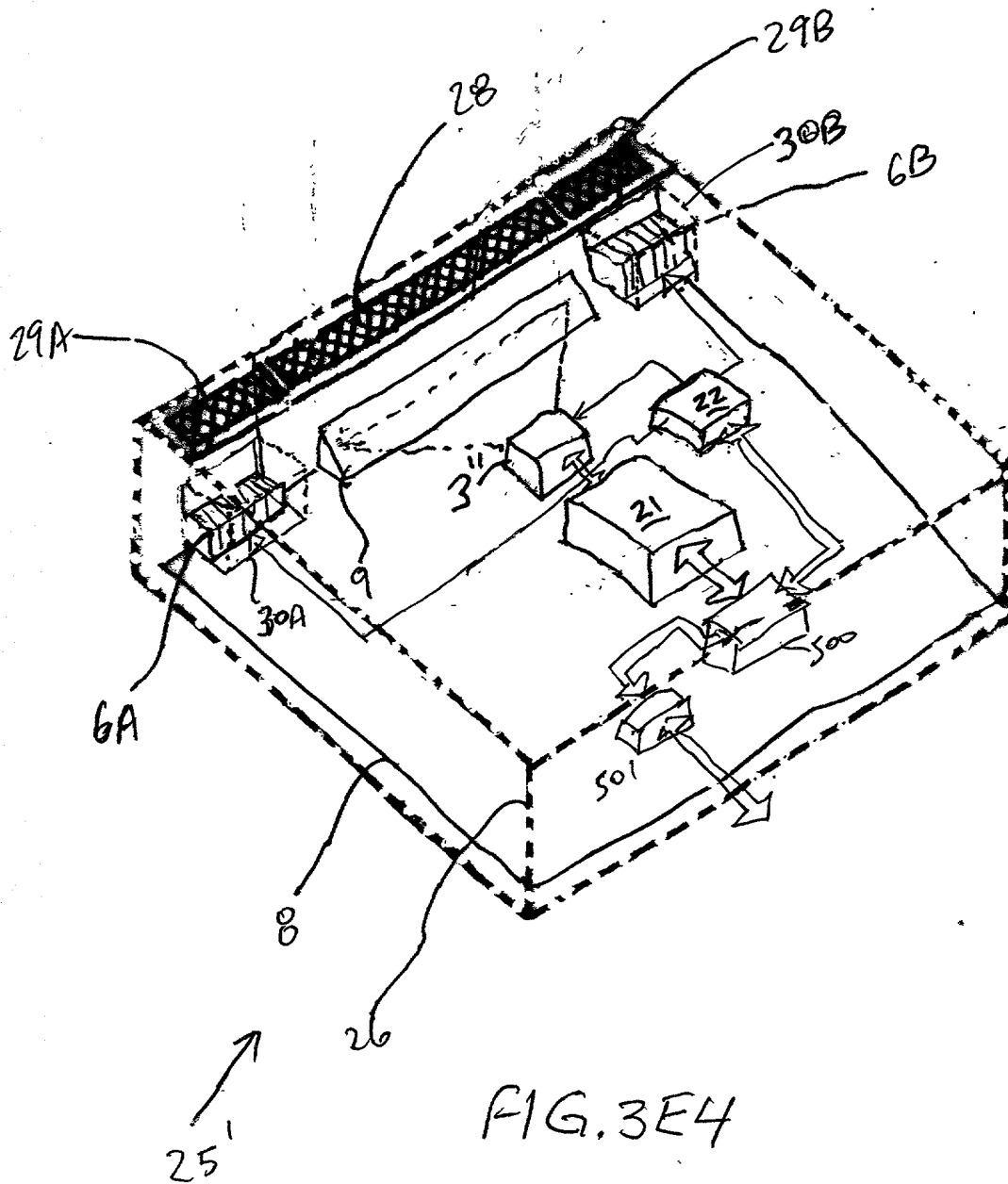
FIG. 3E2

508 →





142 | 332



143/332

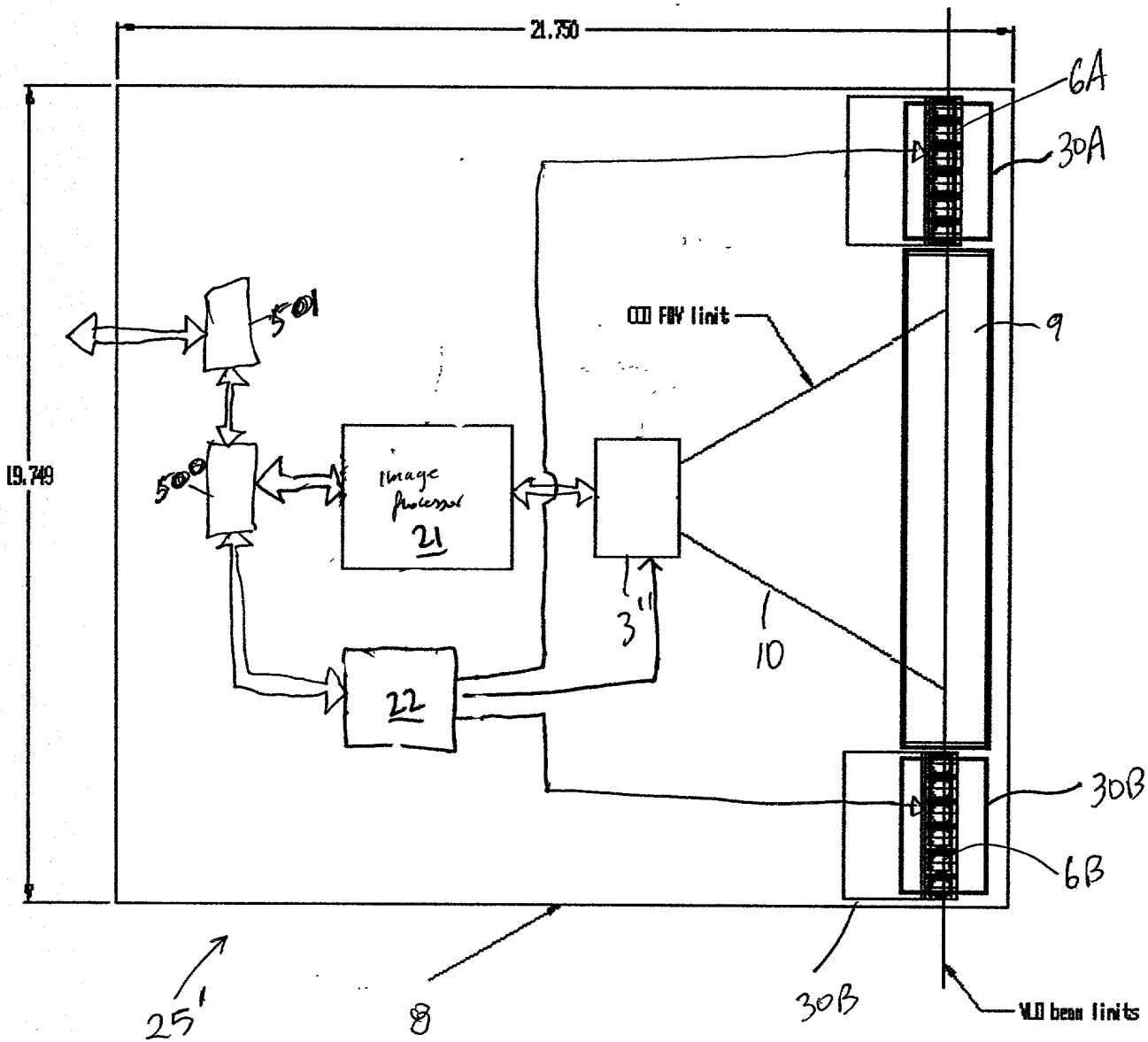


FIG. 3E5



145/332

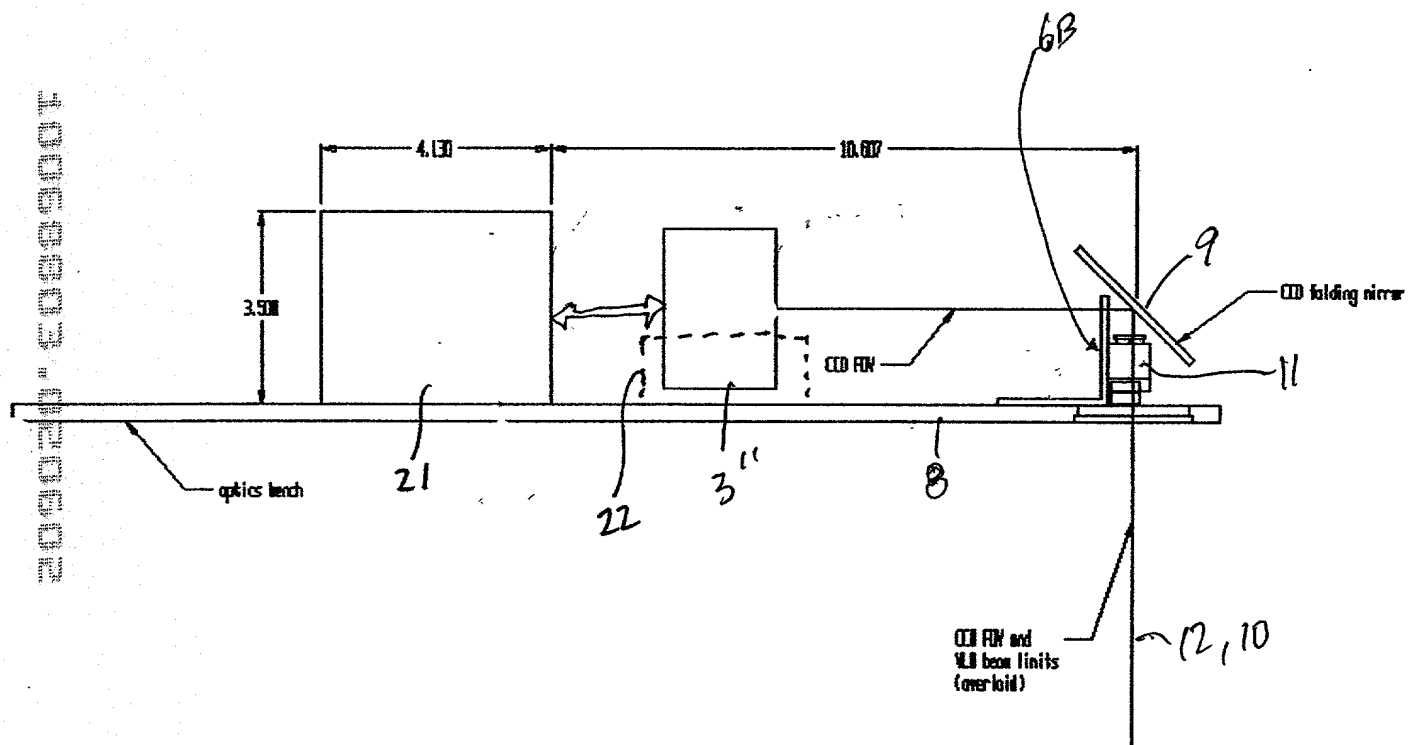


FIG. 3E7

146/332

\*Variable FOV

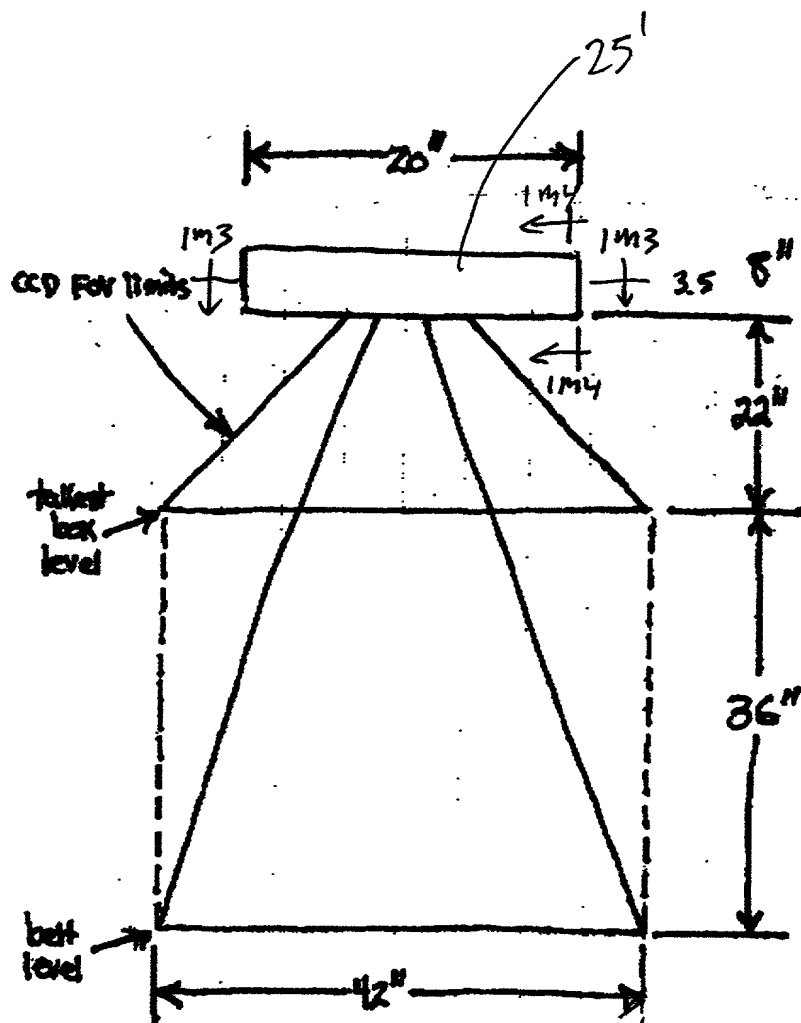


FIG. 3E8

147/332

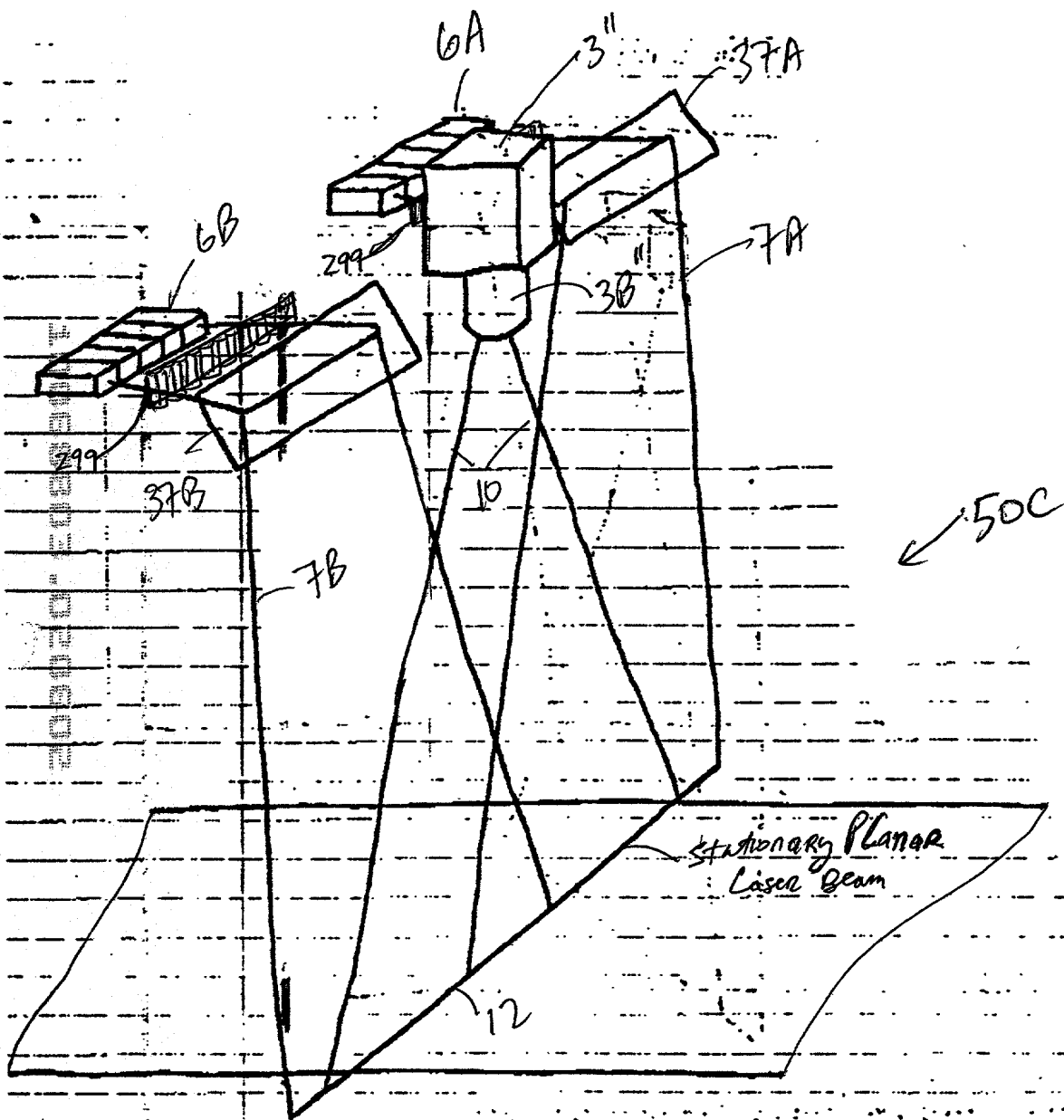
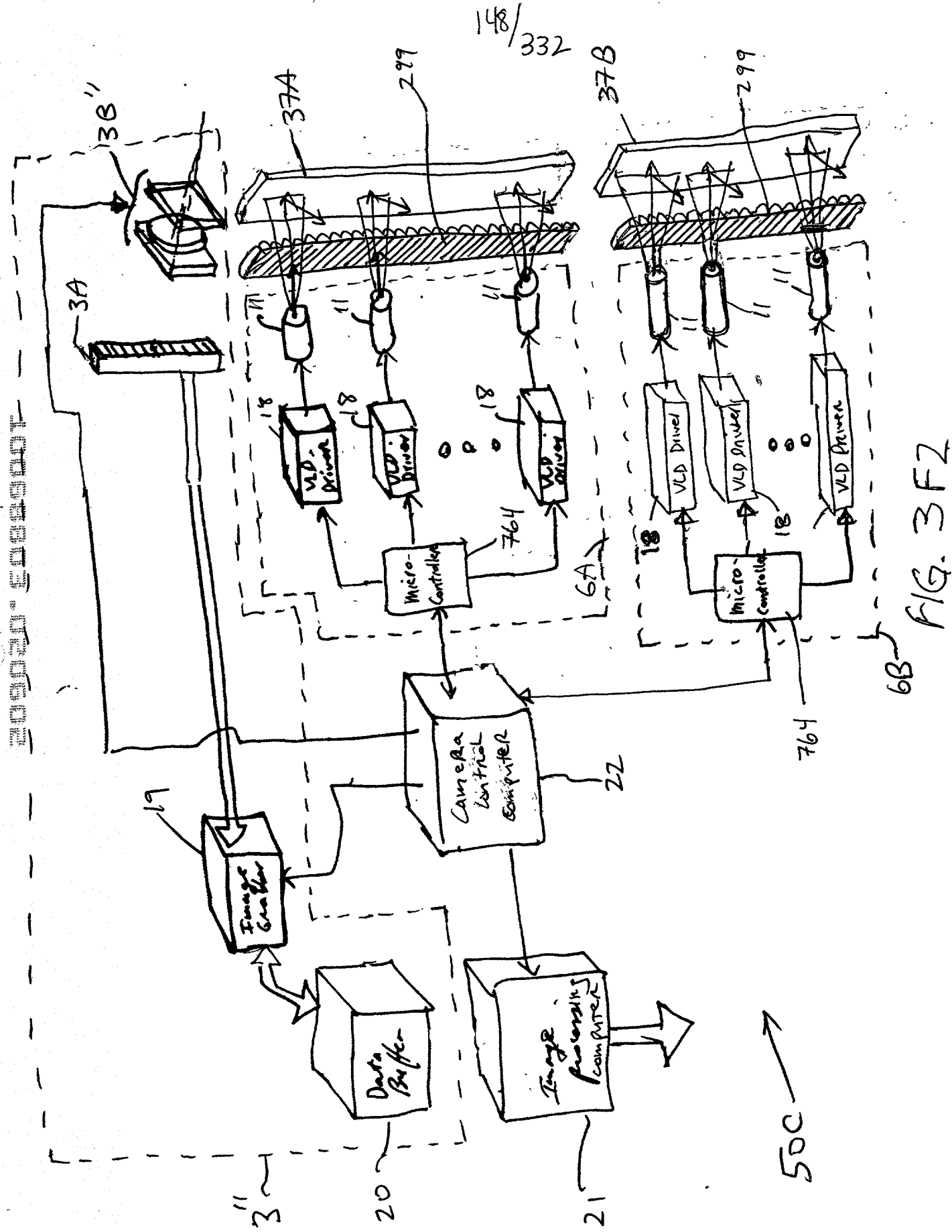


FIG 3F1

$$148/332$$


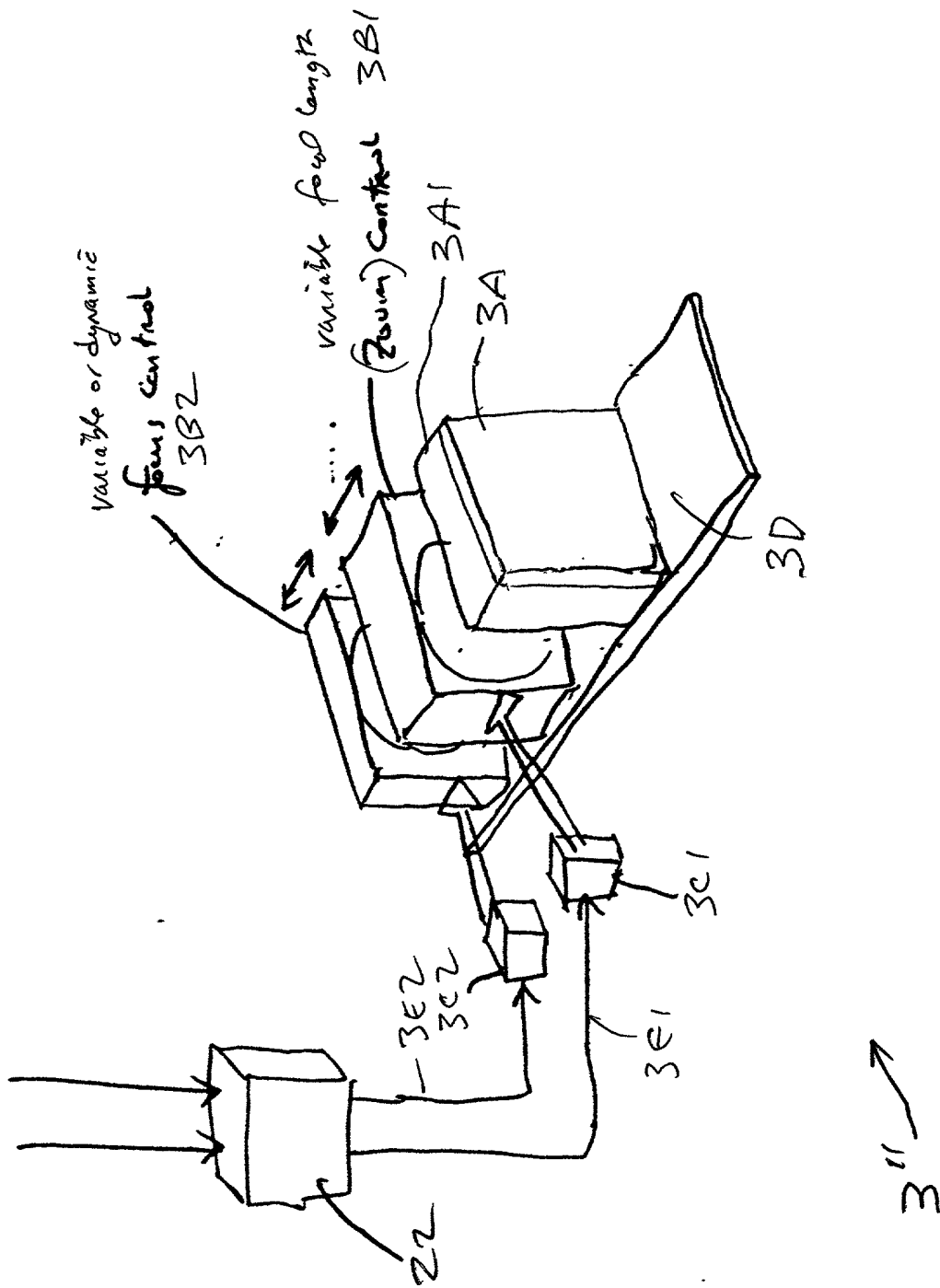


FIG. 3F3



150/332

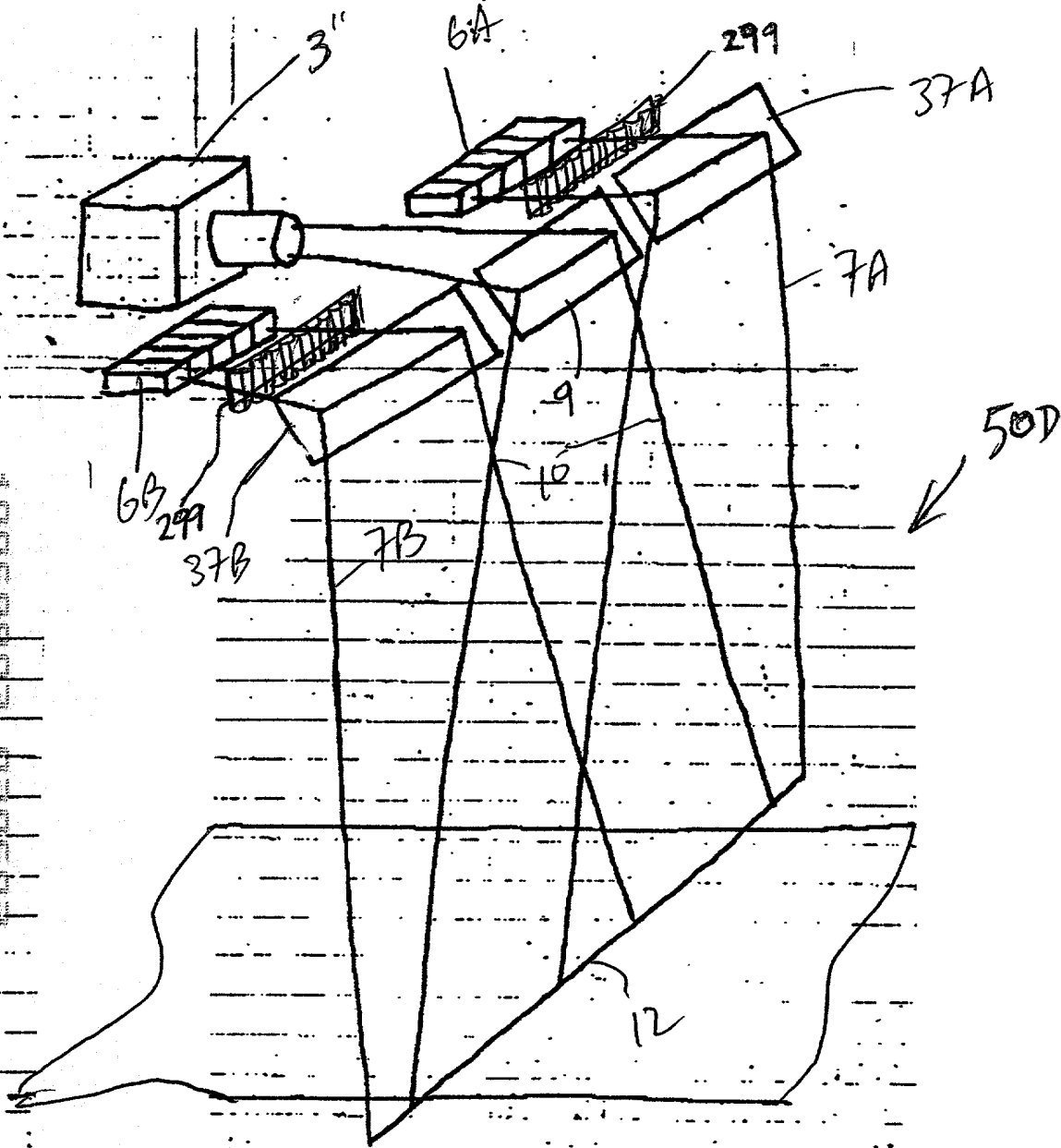
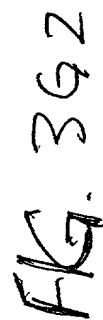


FIG. 3G1



50

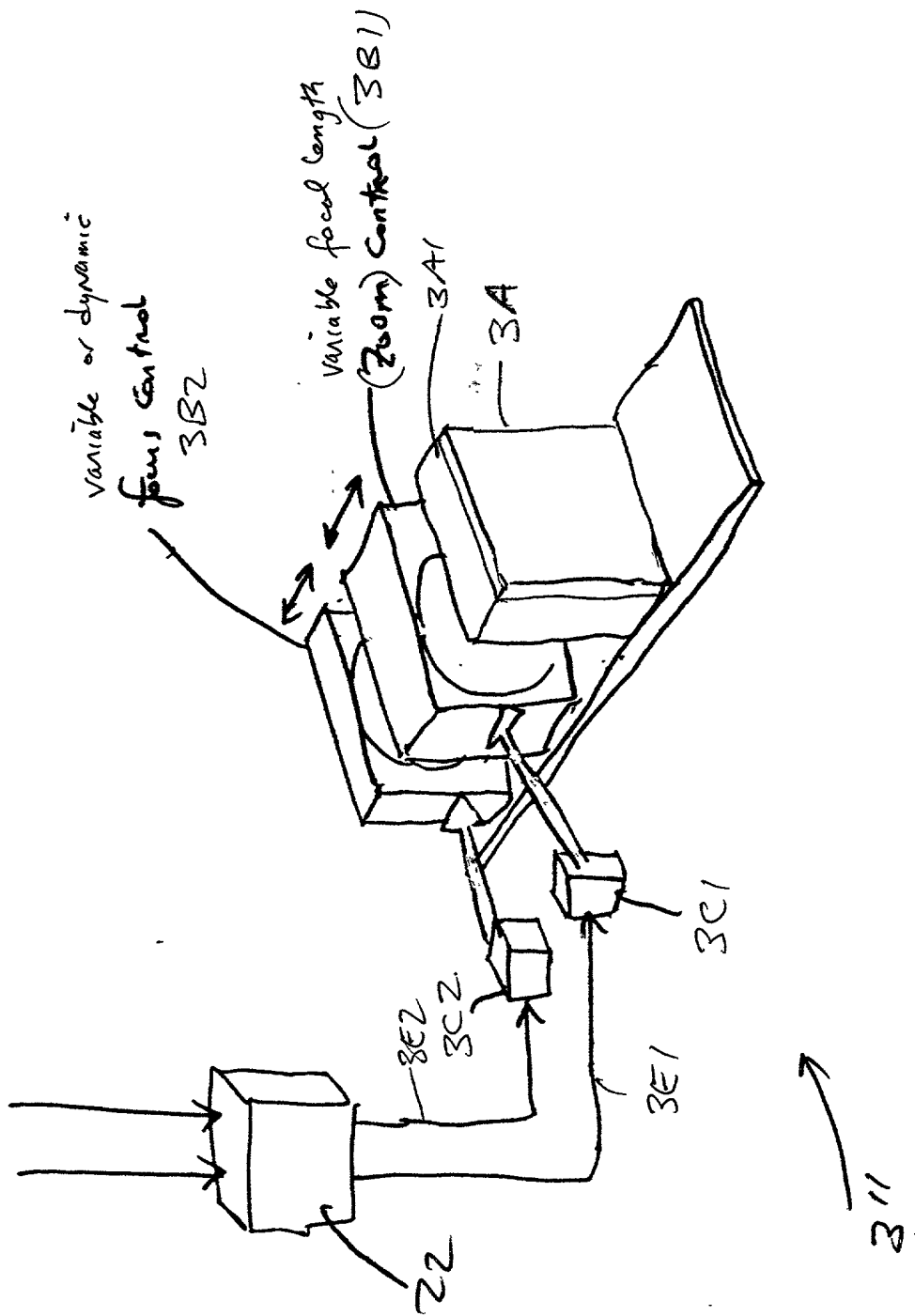


FIG. 3G3

153/332

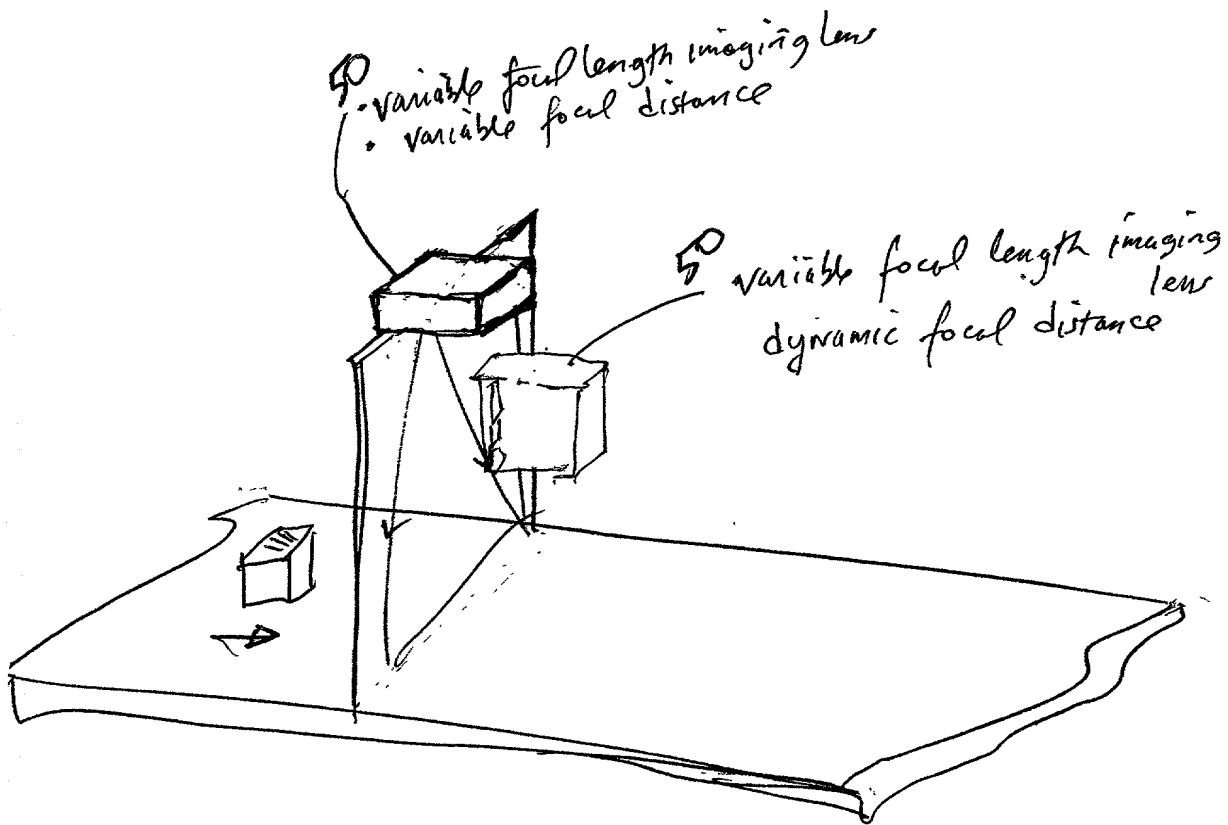


FIG. 3H

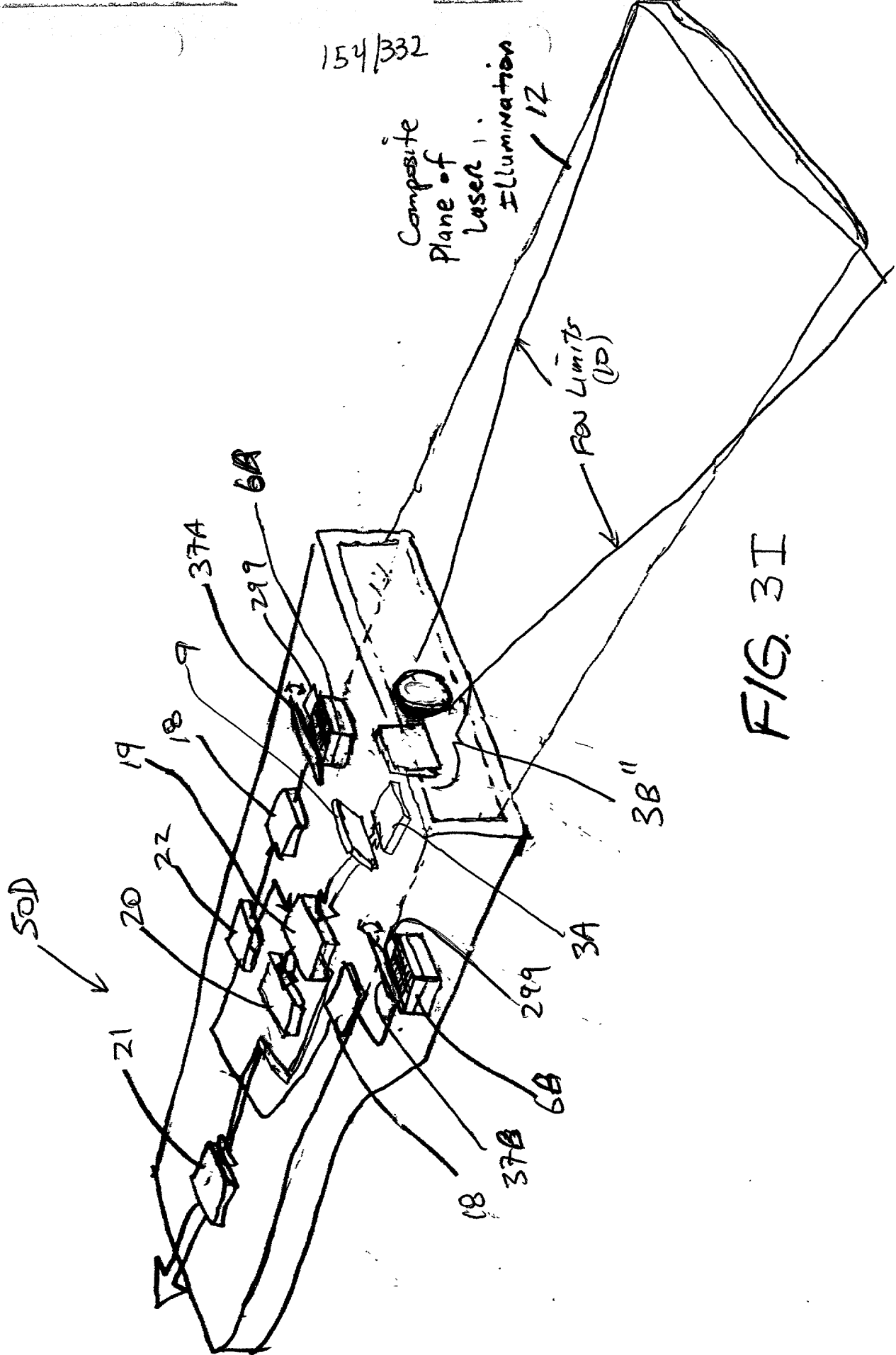


FIG. 3I

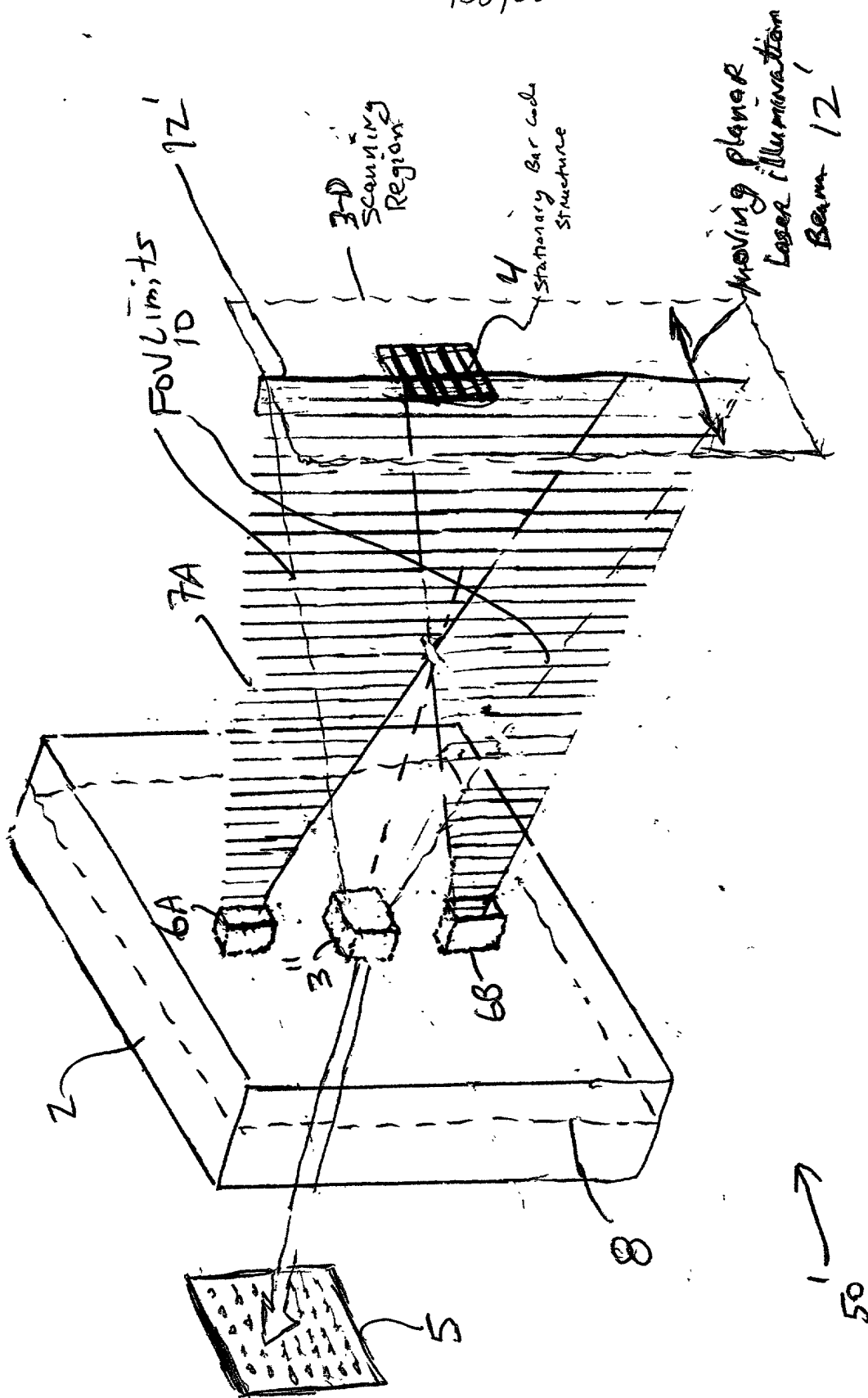


FIG. 3J1

156/332

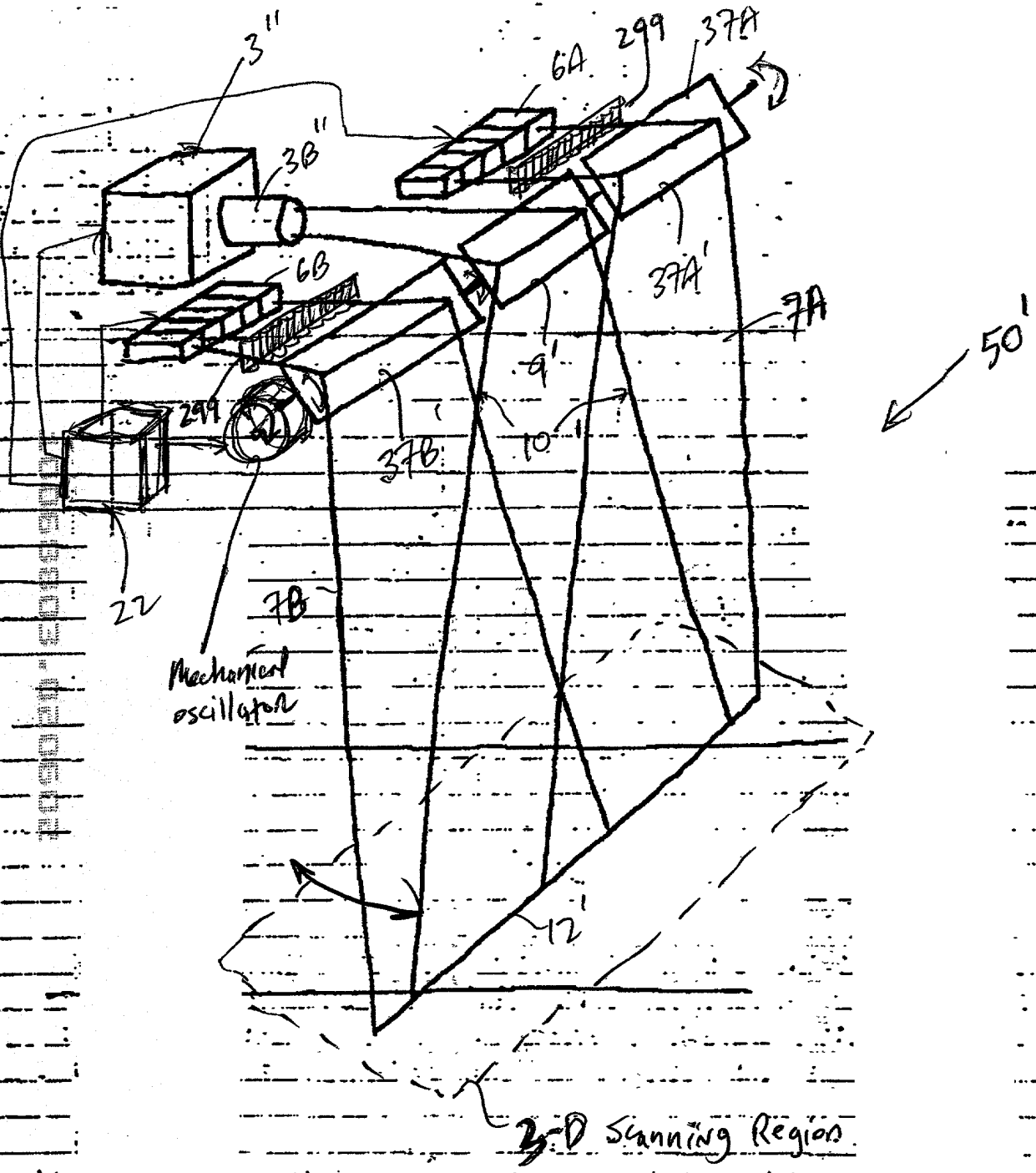
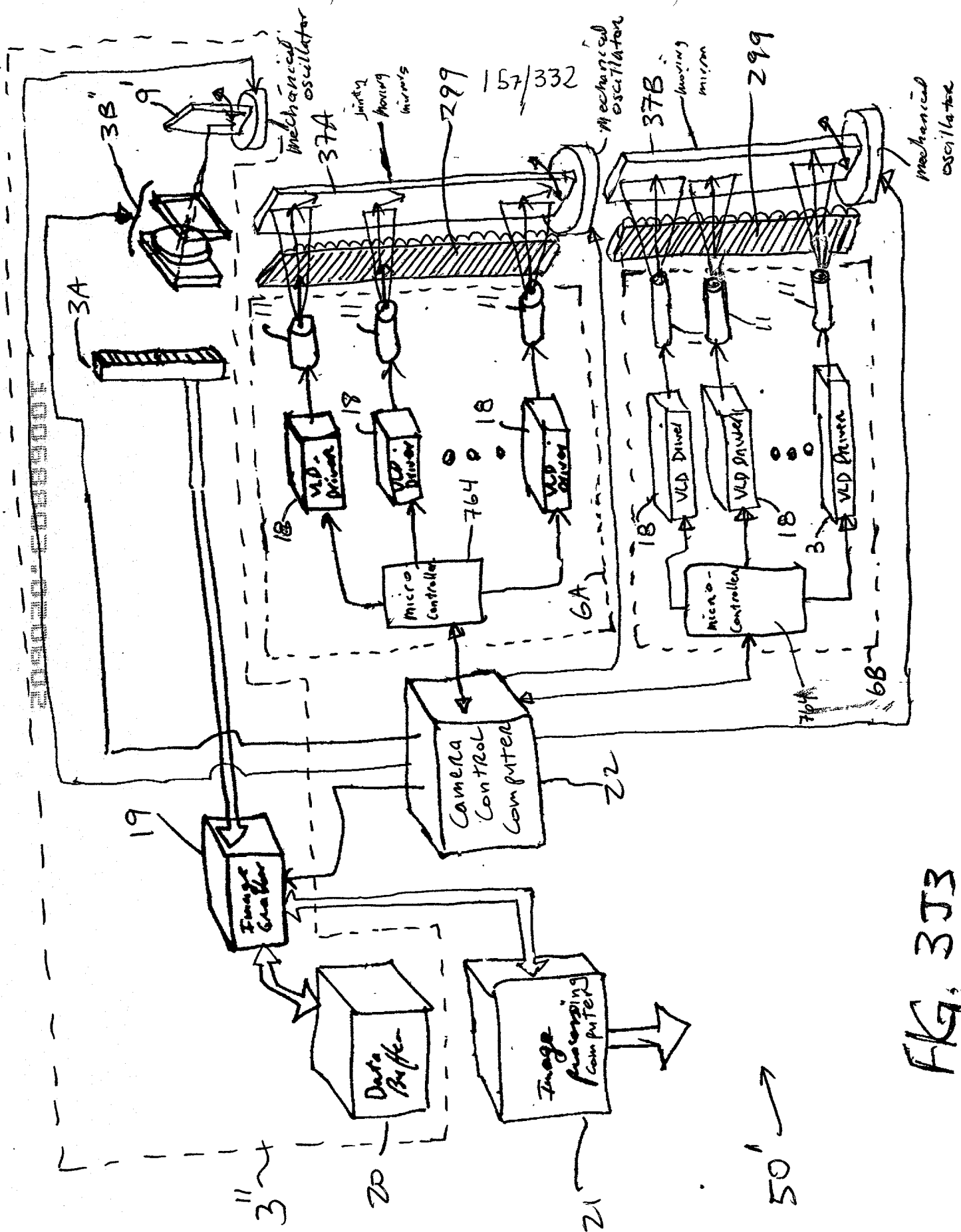


FIG 3J2



353  
FV



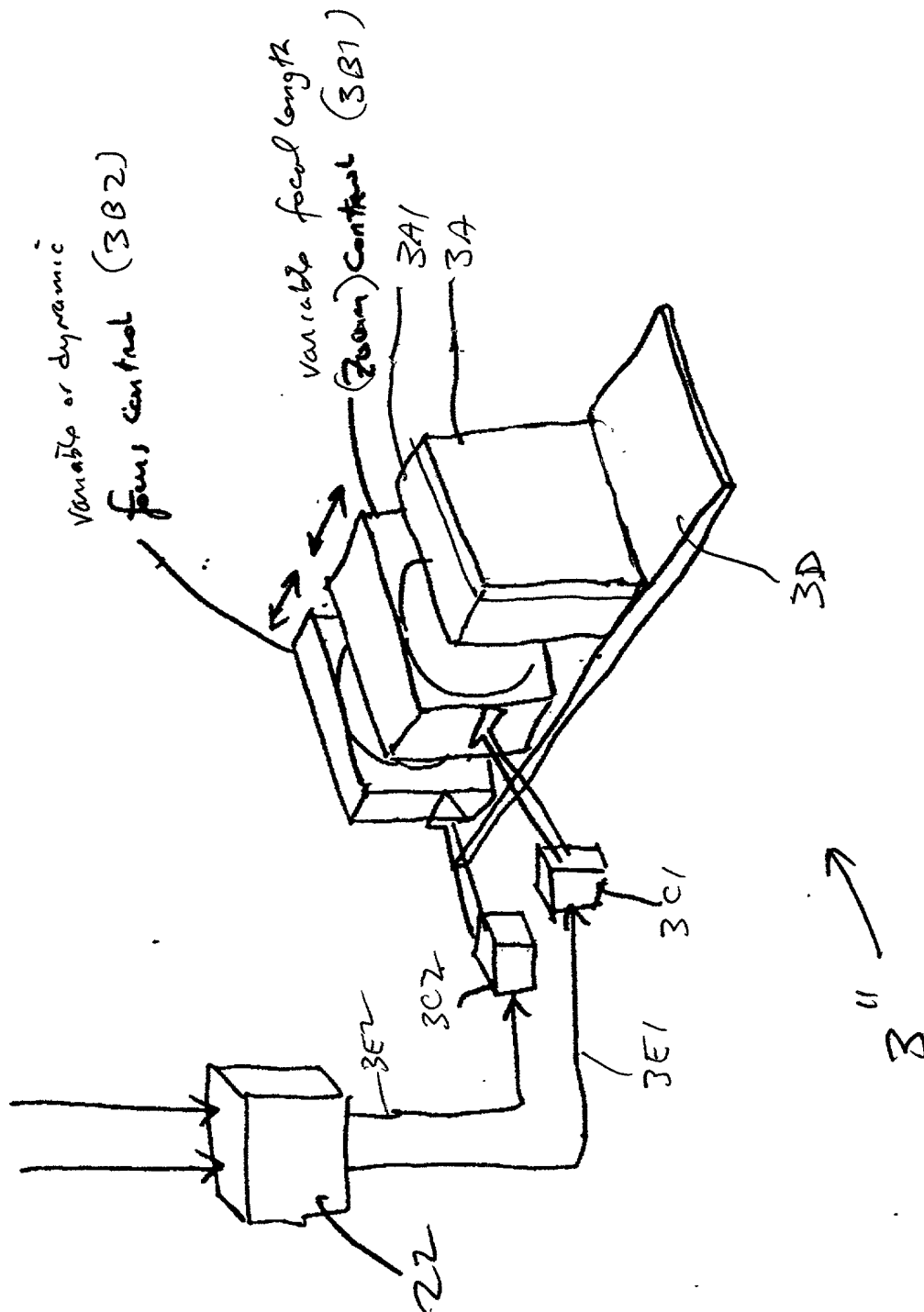
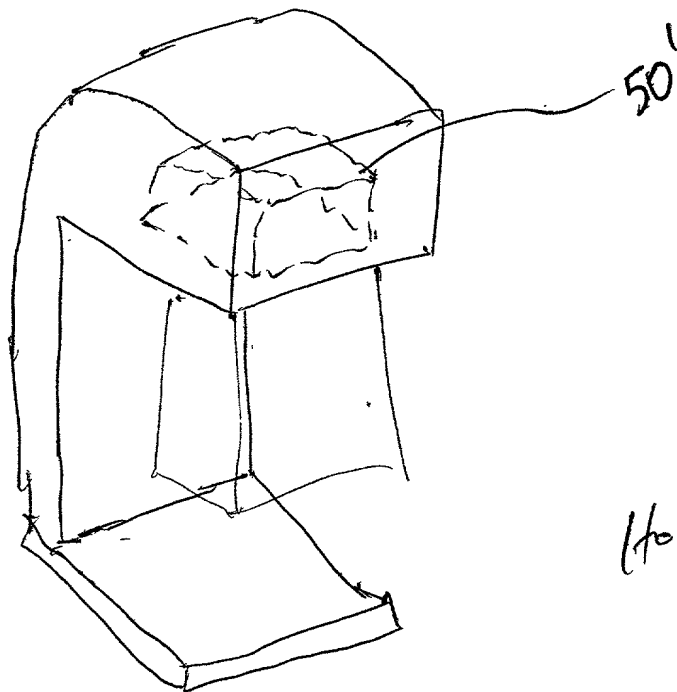


FIG. 3J4



10068803-020000



2-D  
hold-under  
scanner

FIG. 3J6



162/332

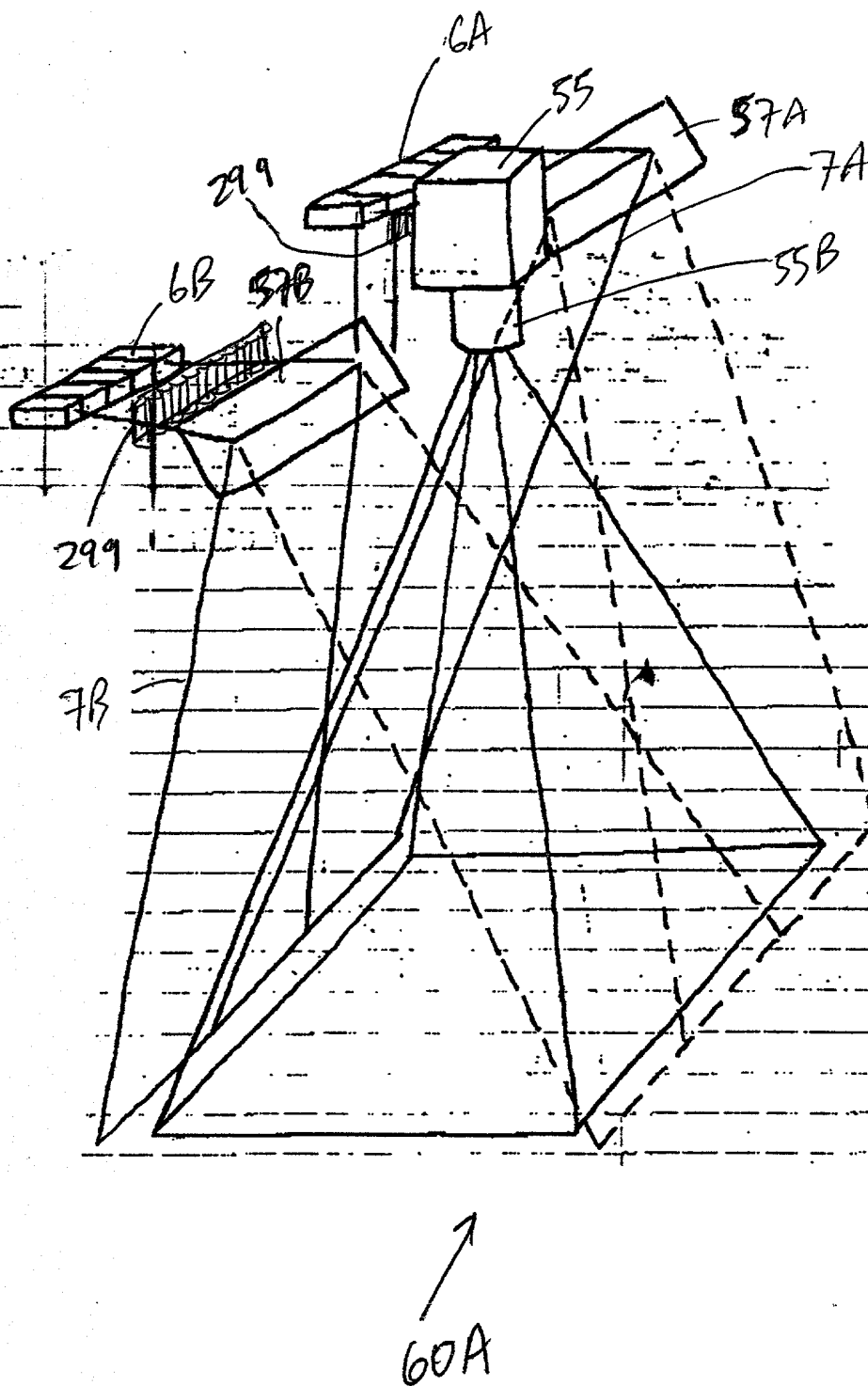


FIG. 4B1

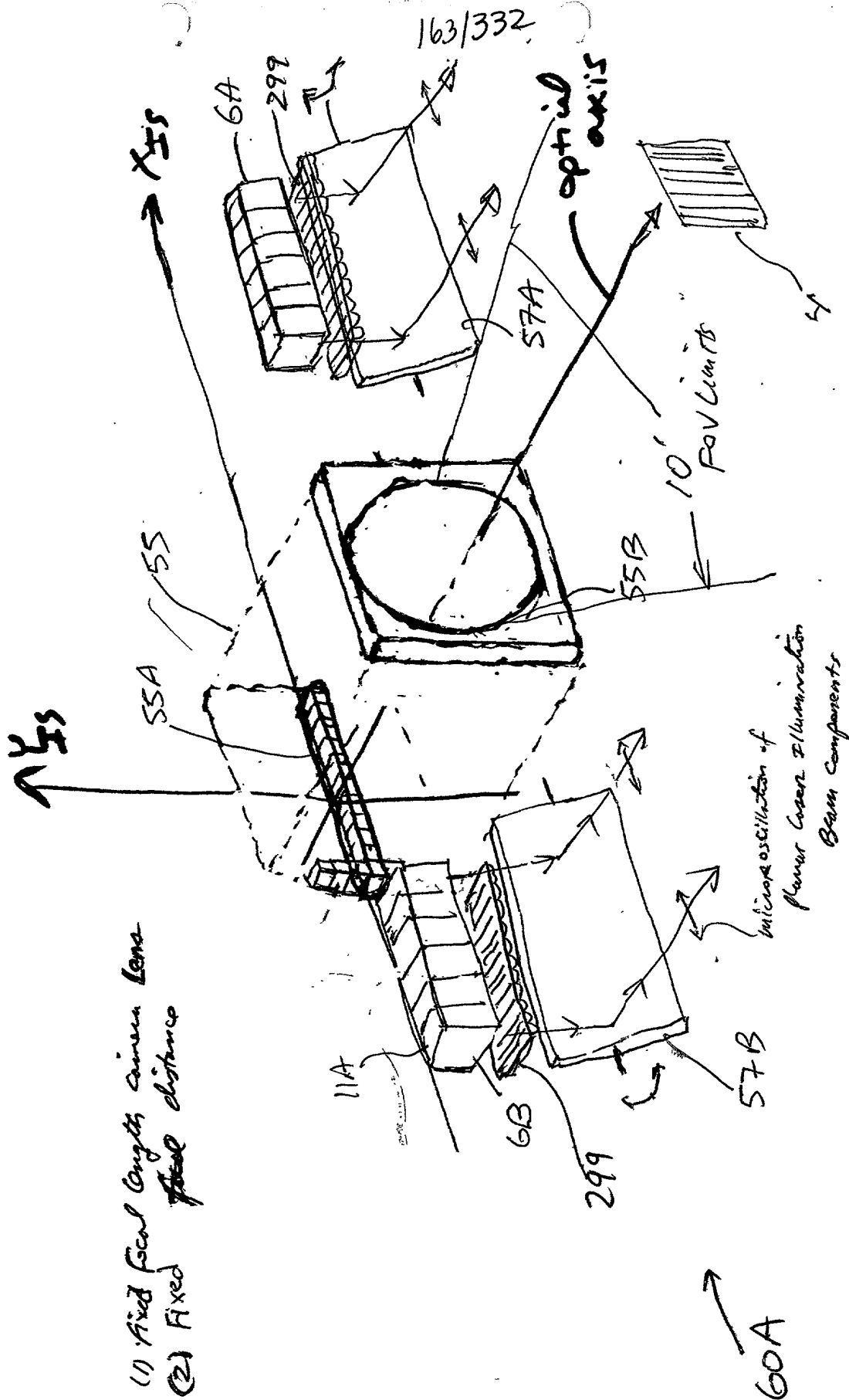


FIG. 4BZ

200020\* 00889001

164/332

fixed focal length  
fixed focal distance

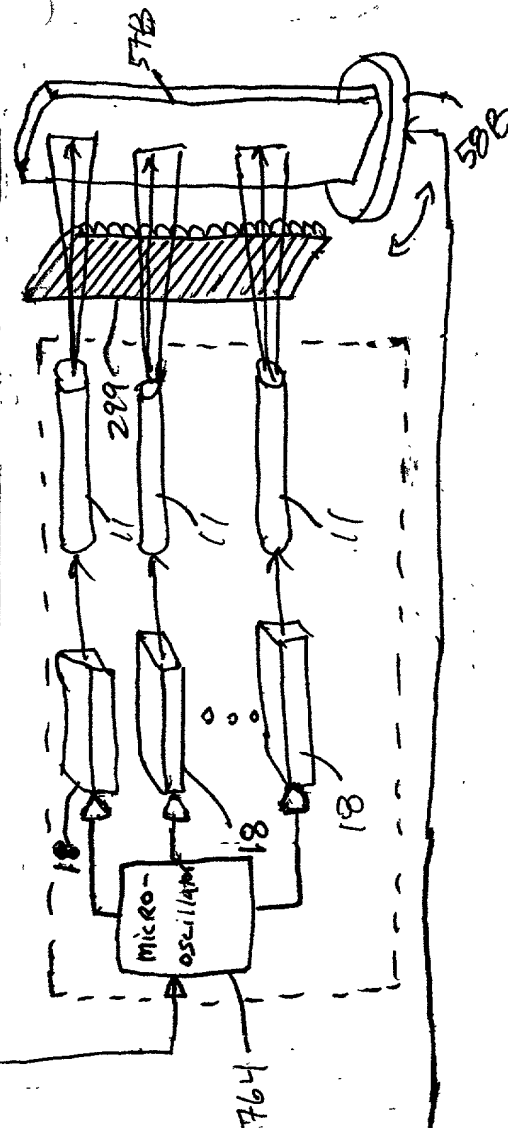
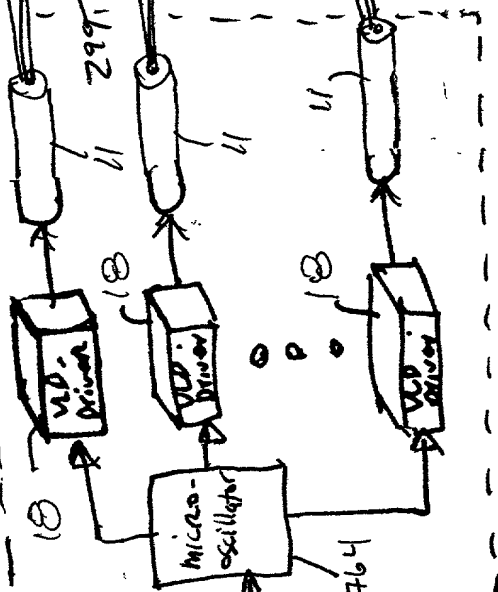
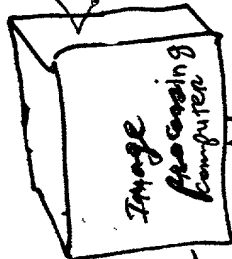
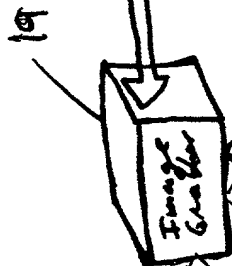
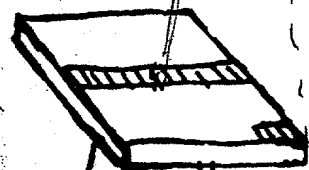


FIG. 4B3

60A

165/332

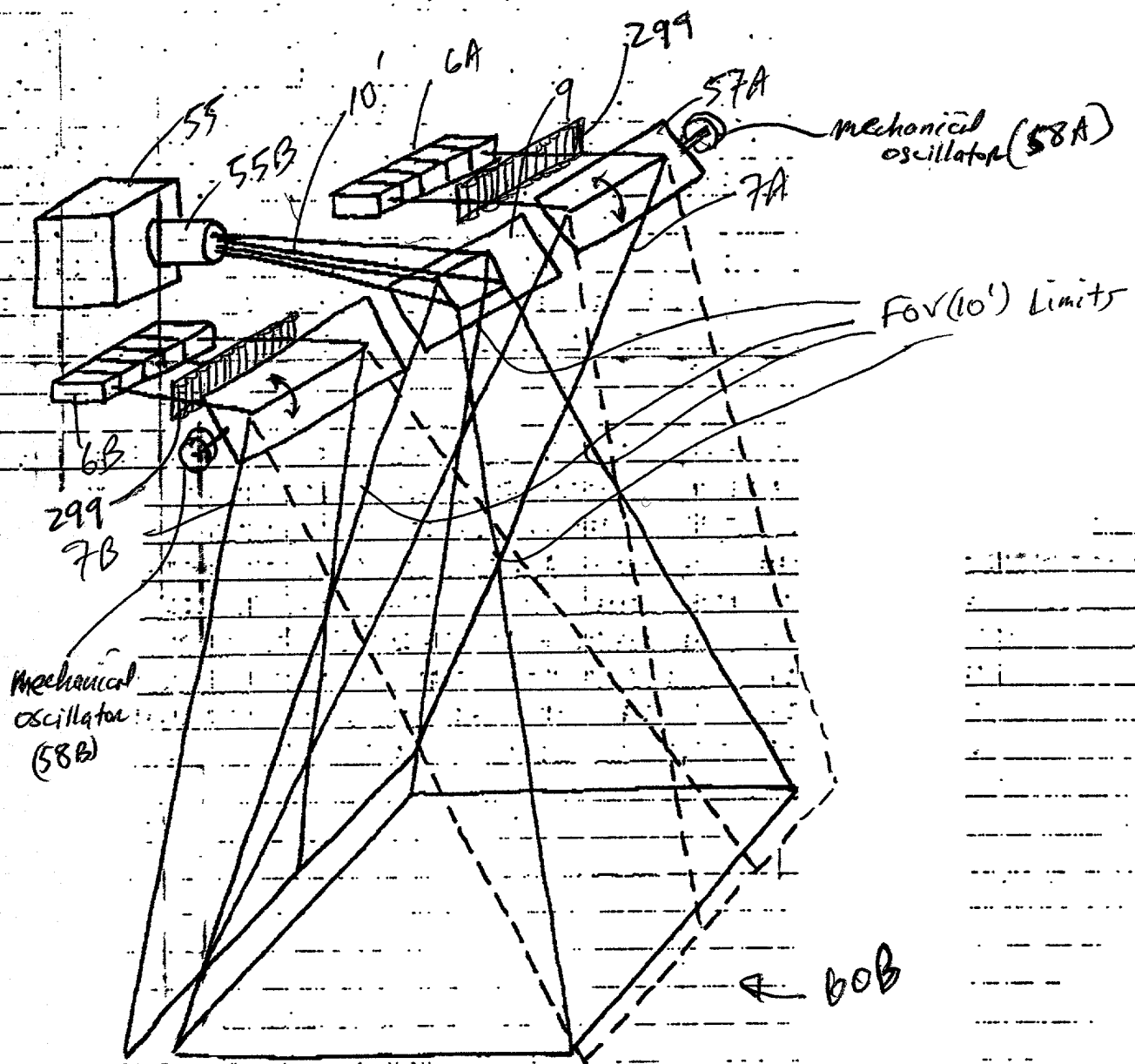


FIG. 4C1



**SECRET**

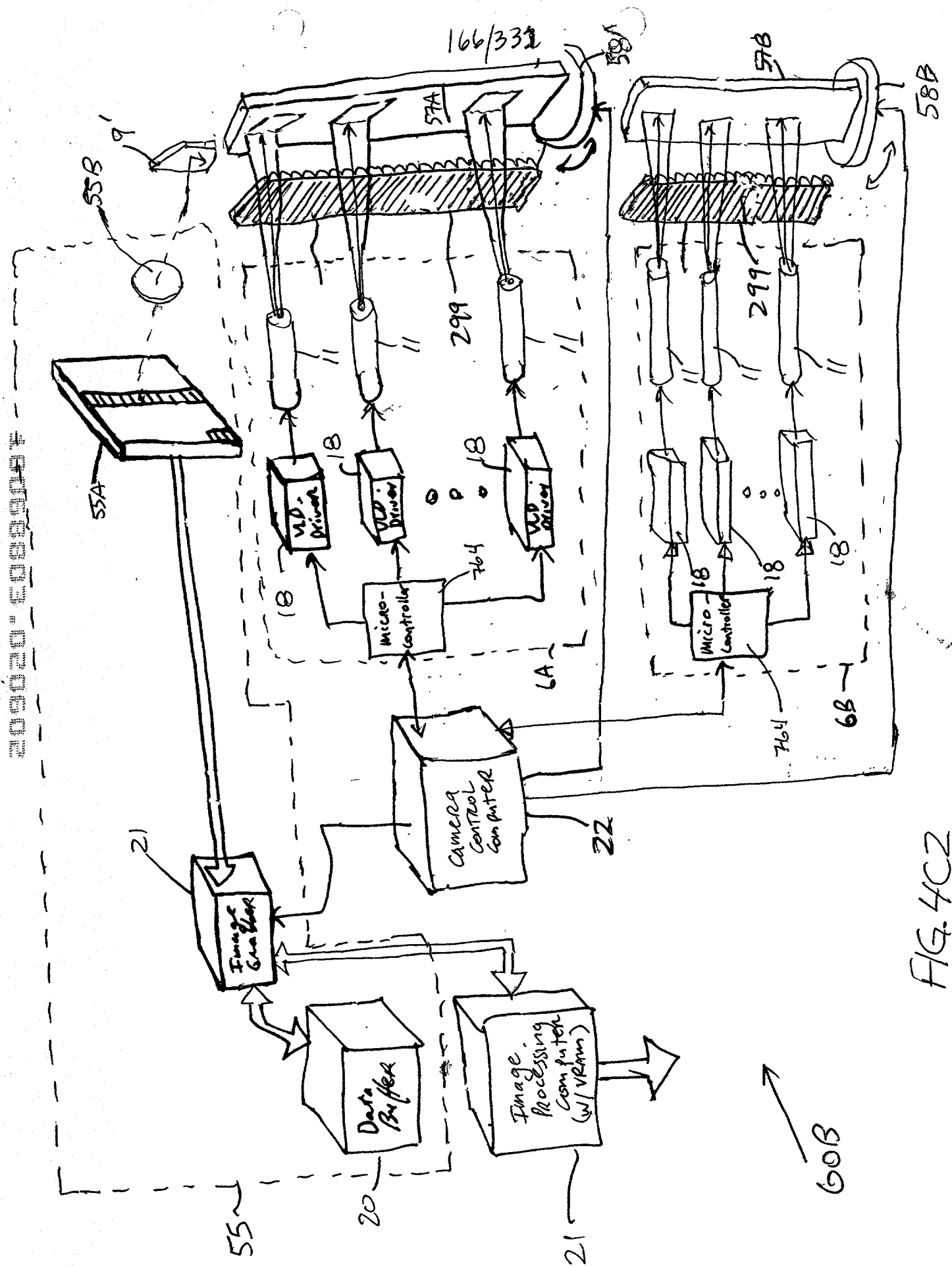


FIG. 4C2

167/332

10068803.020602

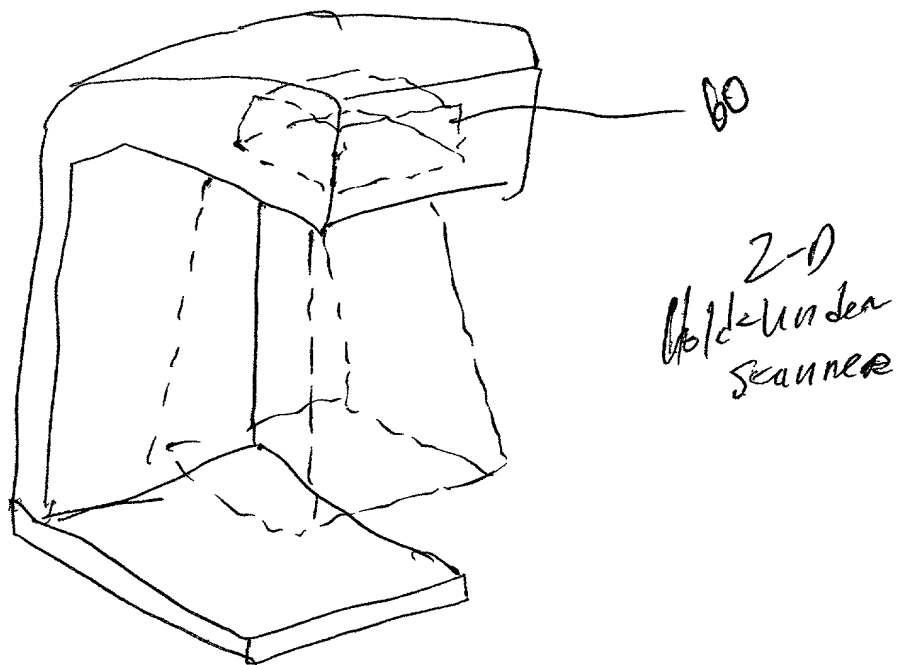


FIG. 4D





10066803.020602

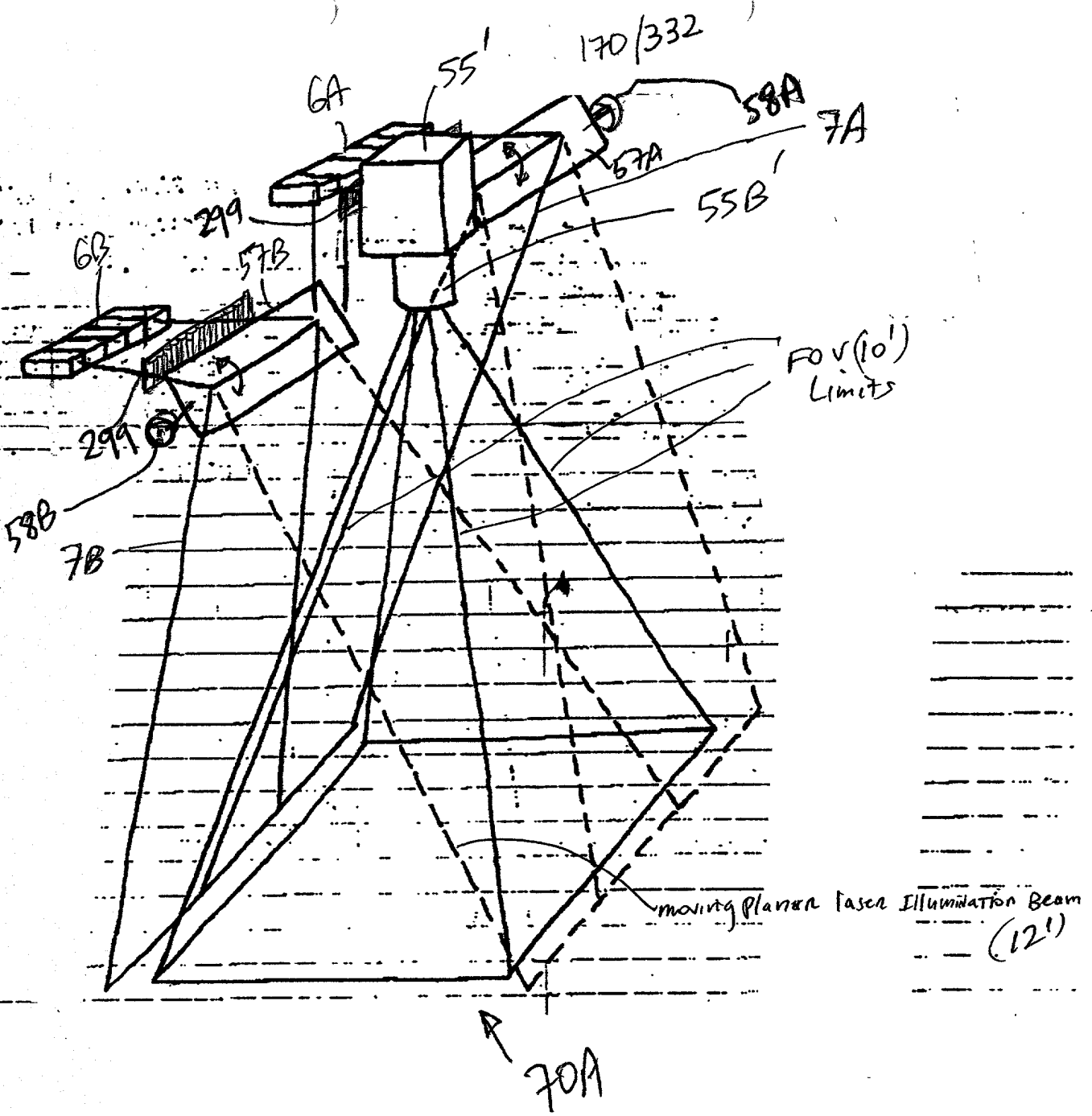
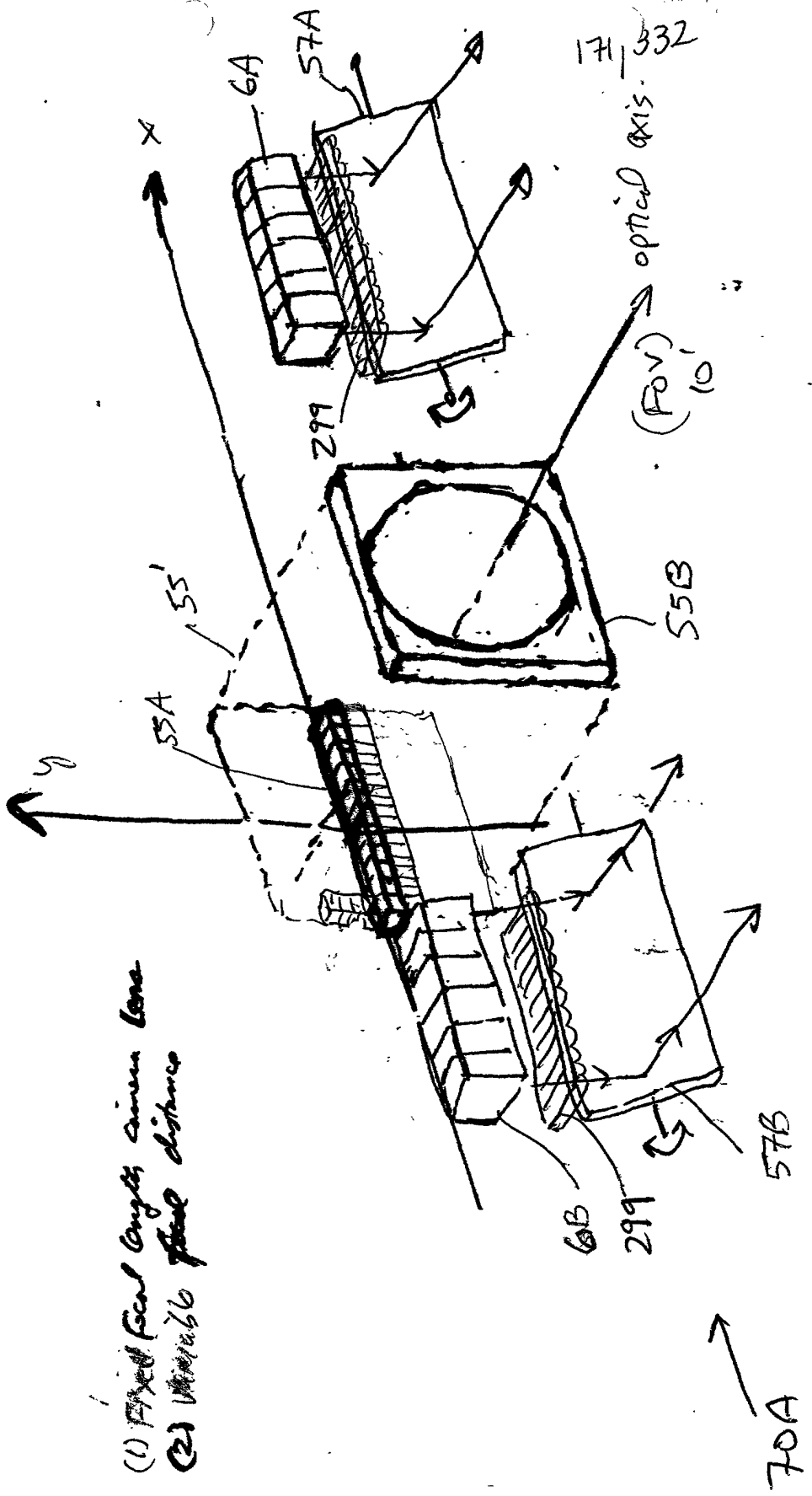


FIG 5B1

2009020" E088900T



- (1) Fixed focal length camera lens
- (2) Variable focal distance

FIG. 5B2

172/332

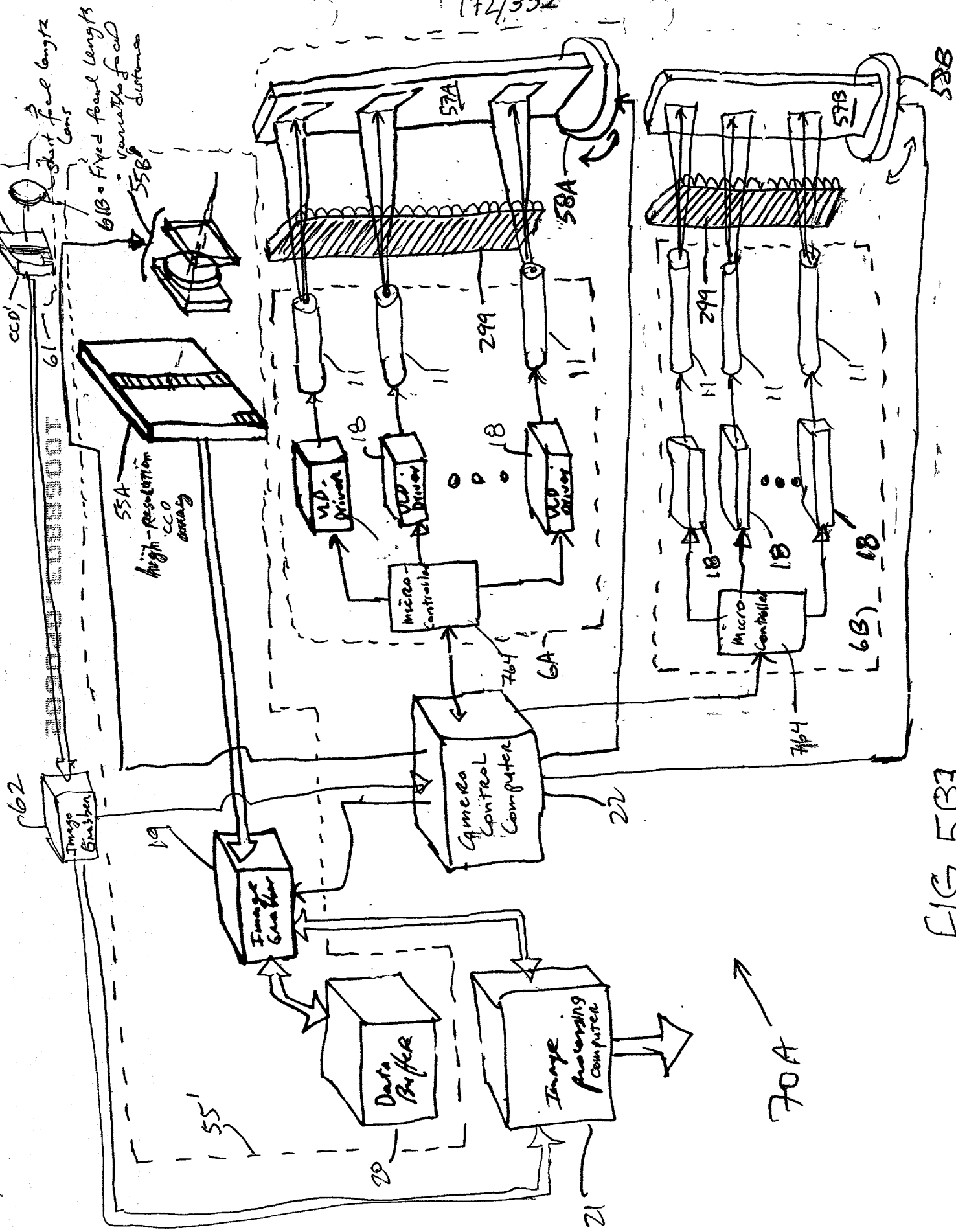
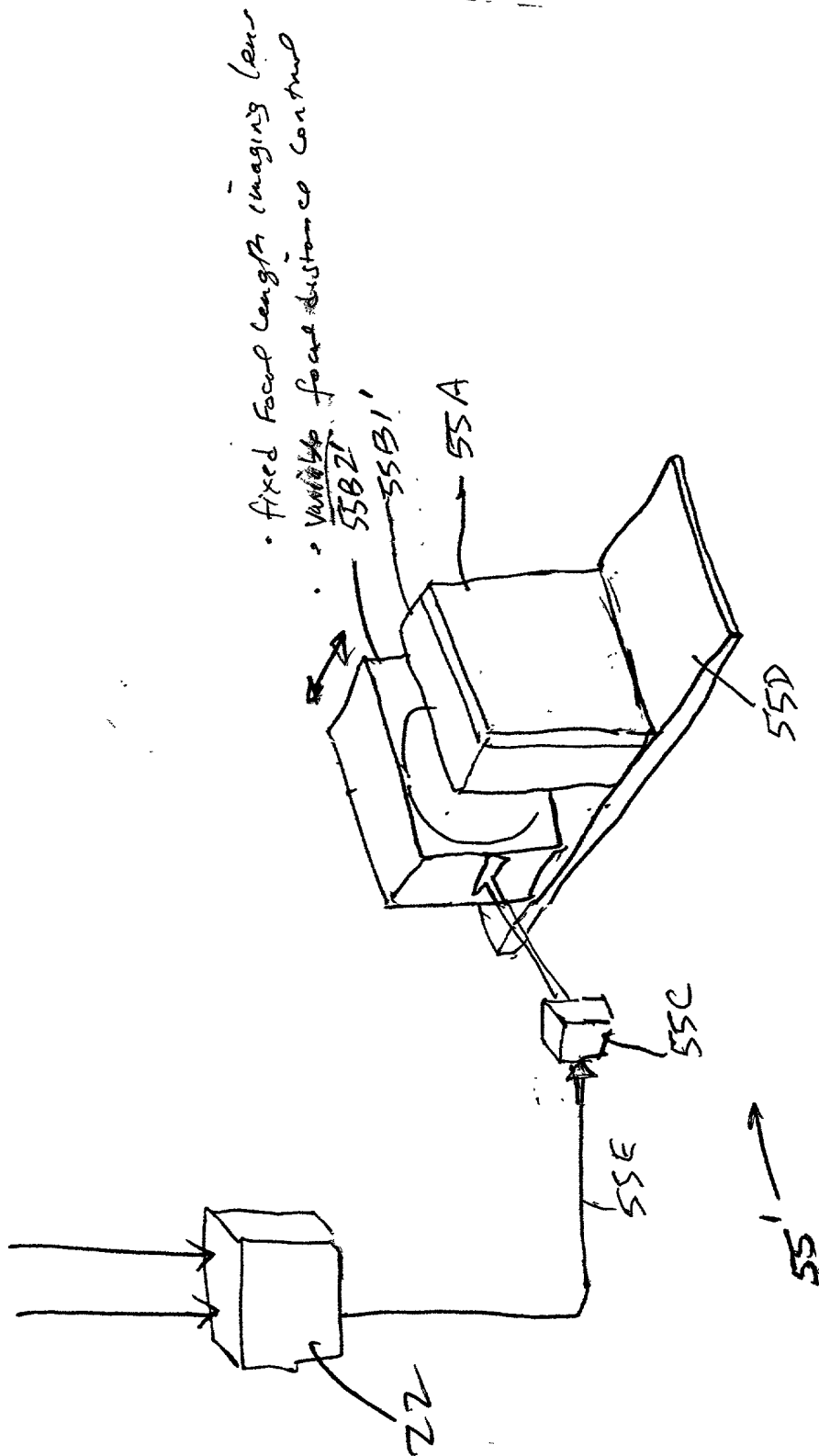


FIG. 5B3



• fixed focal length imaging lens  
 • ~~variable~~ variable focal distance control

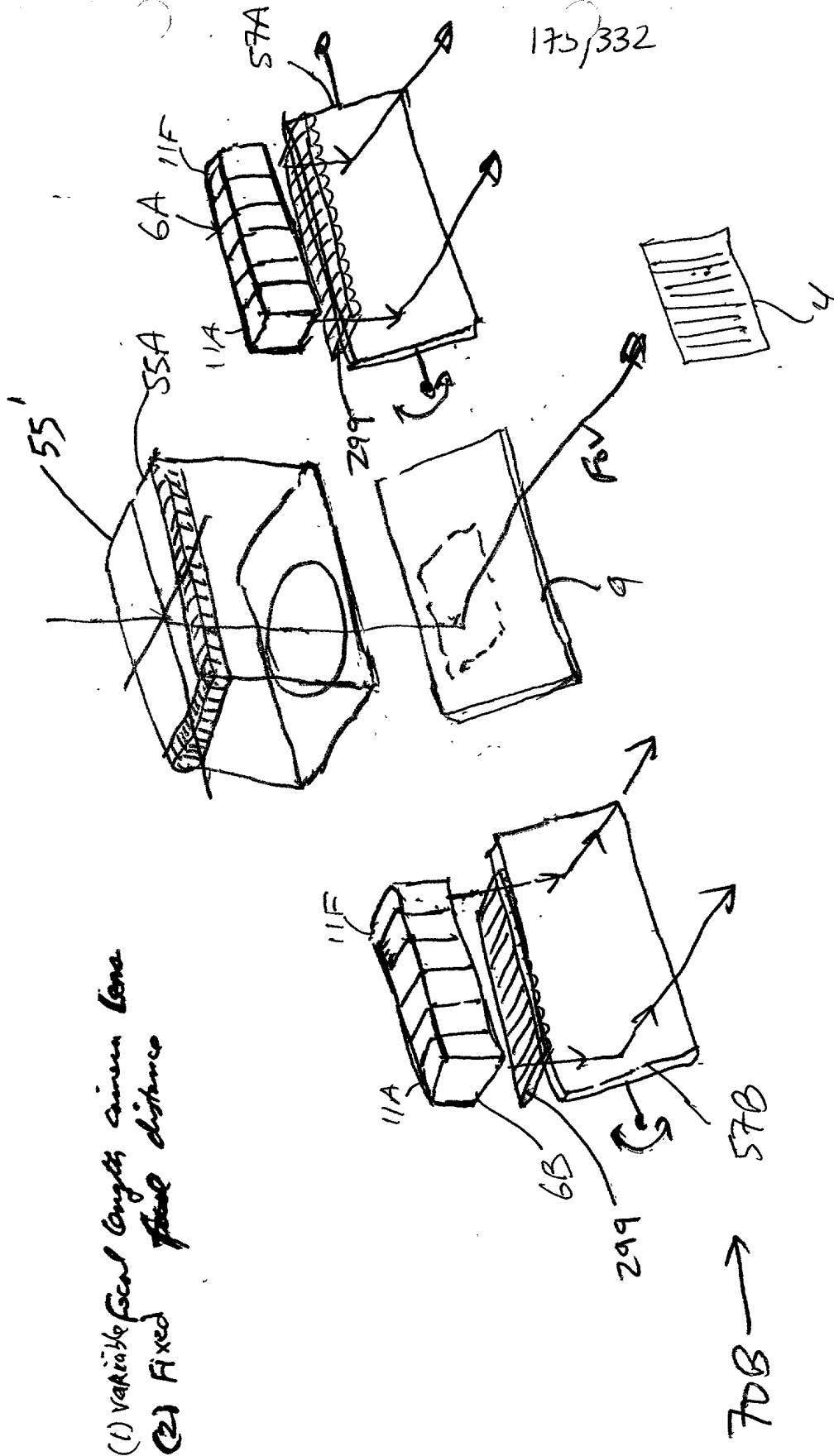
FIG. 5B4



290  
582



$\therefore$  FIG. 5C1



(1) Variable focal length lens  
(2) Fixed focal distance

FIG. 5C

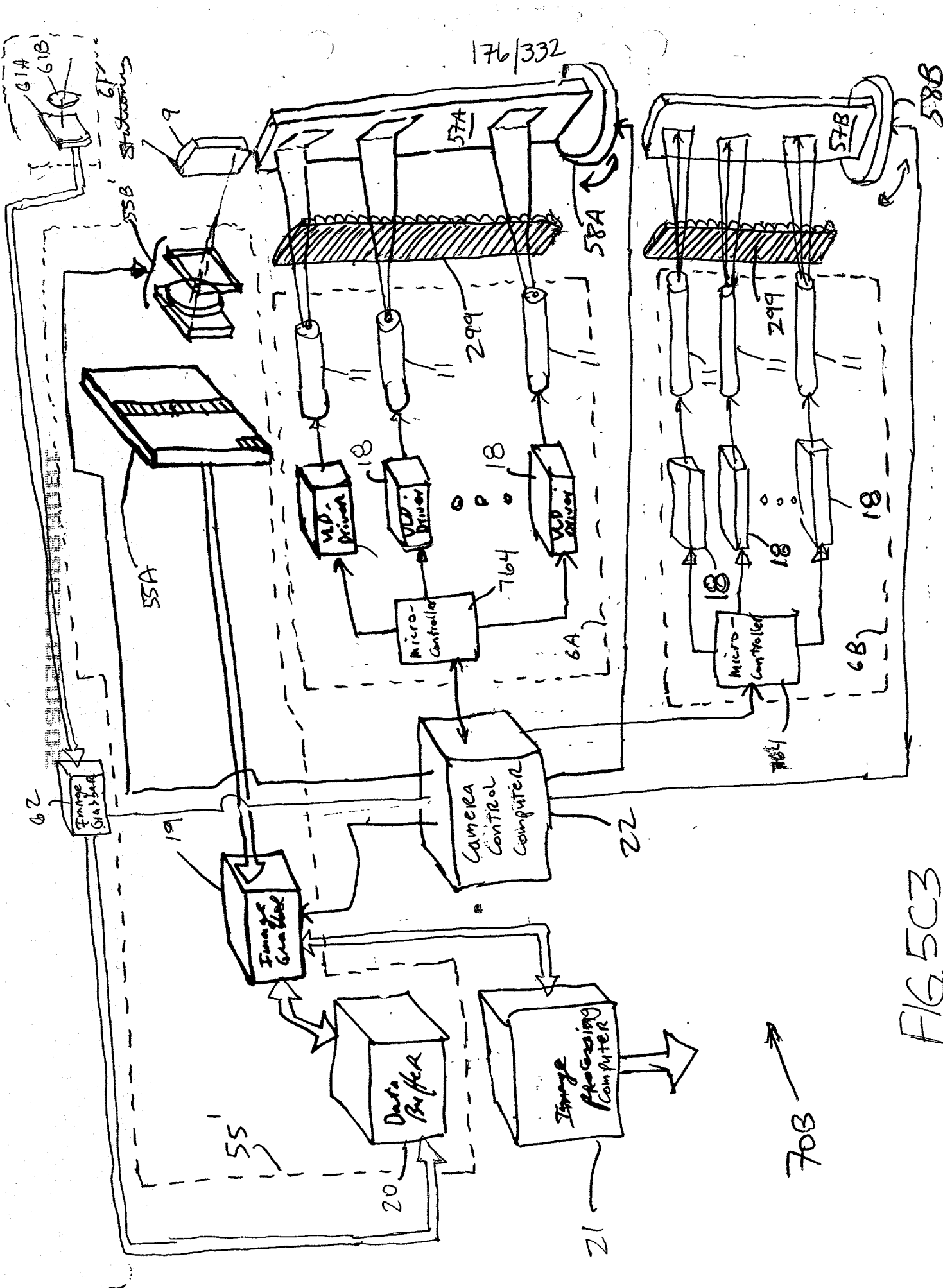
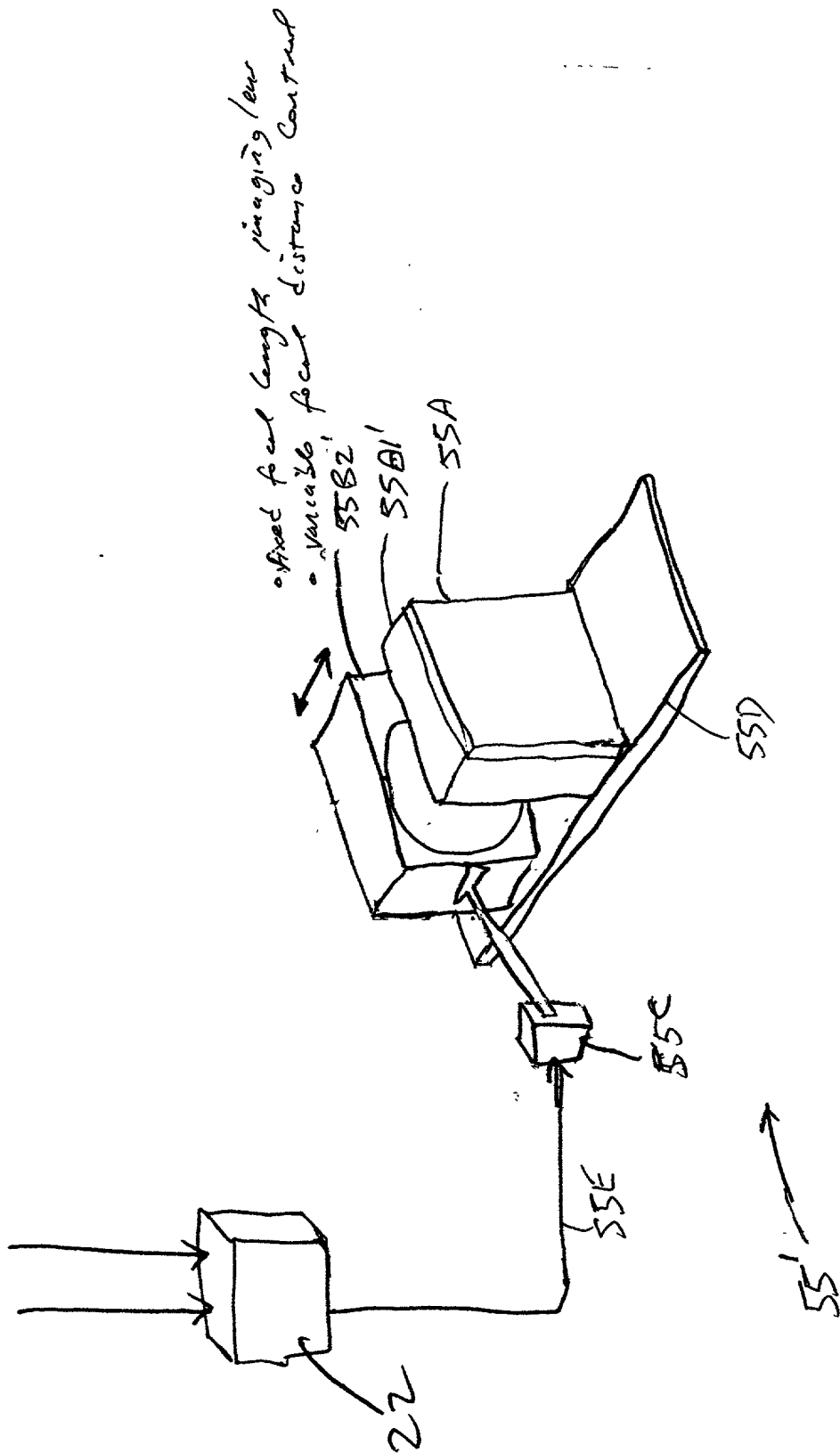


FIG. 5C3



optical focal length, imaging lens  
 • Variable, focus distance control

FIG. 5C4

178/332

10058803-020602

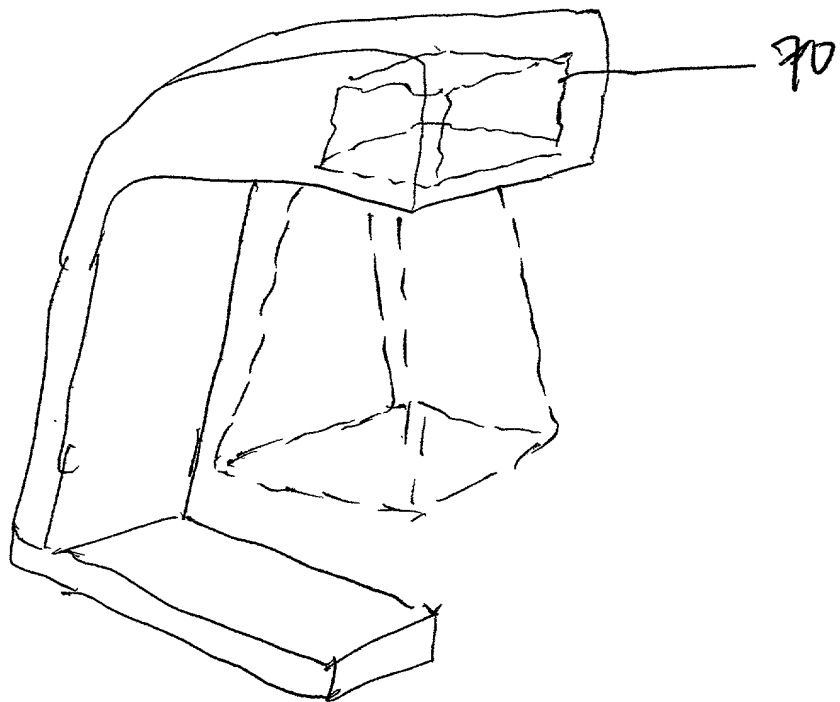


FIG. 5D

2009020-020600

179/332

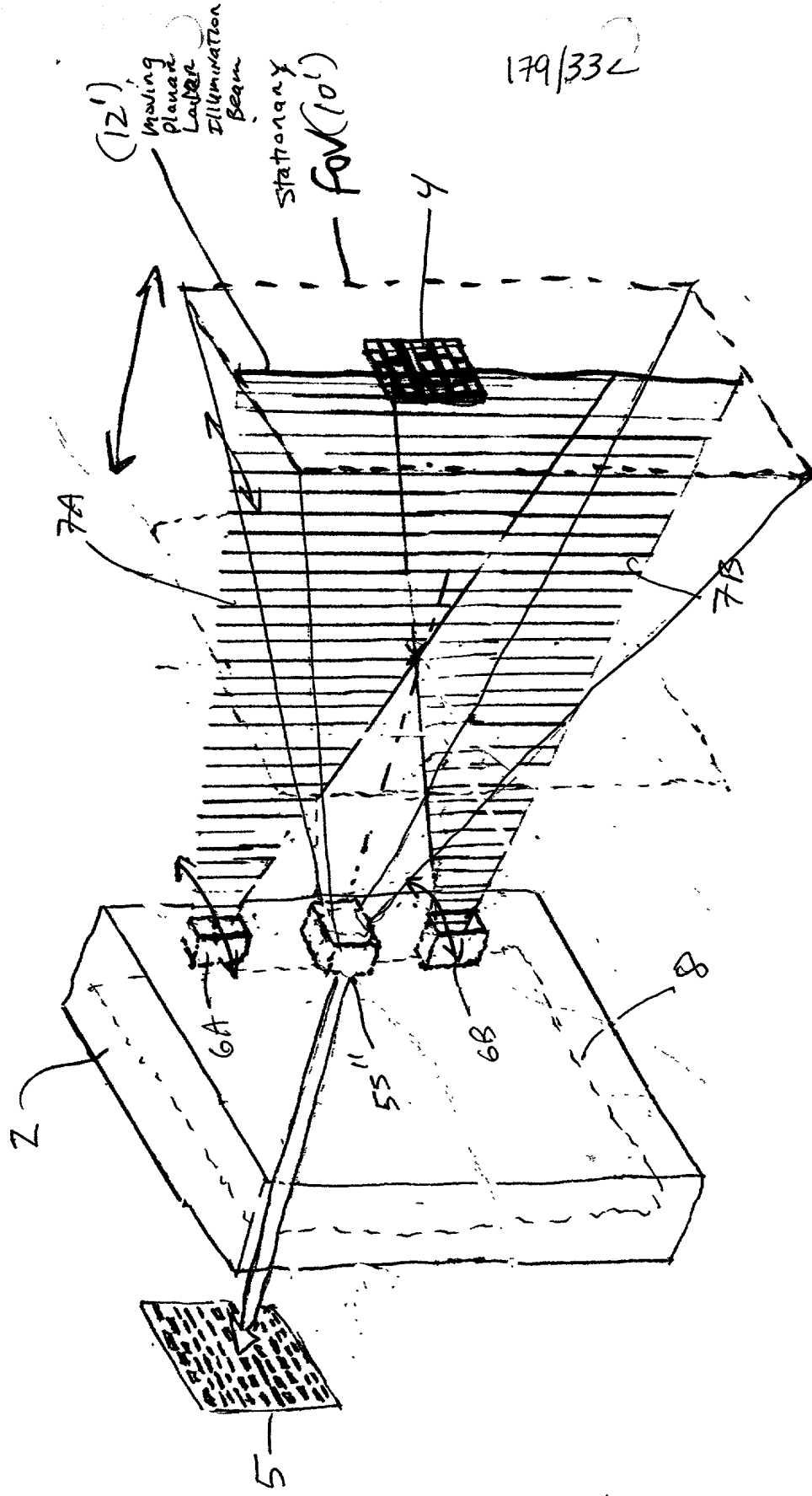


FIG. 6A

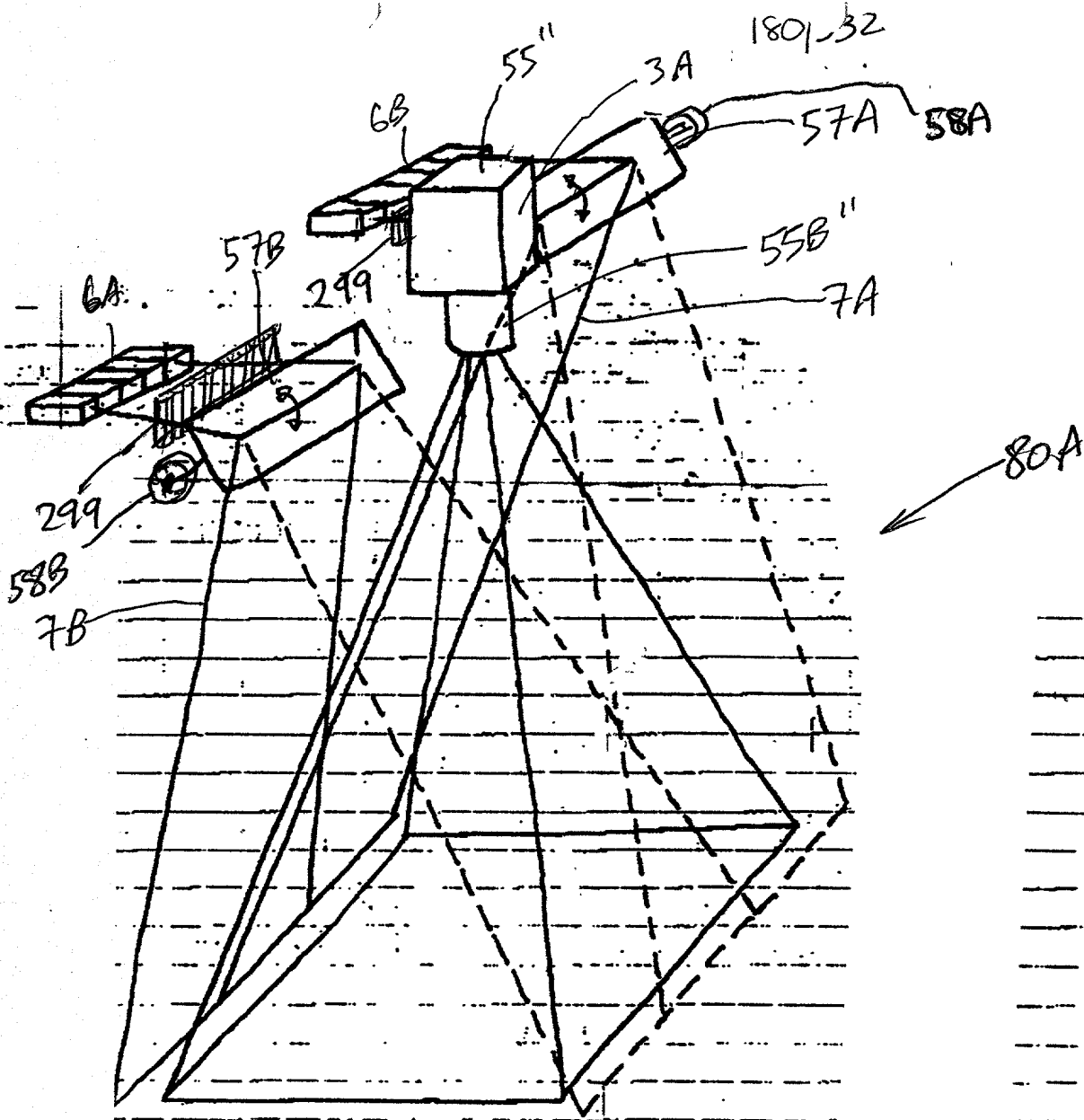
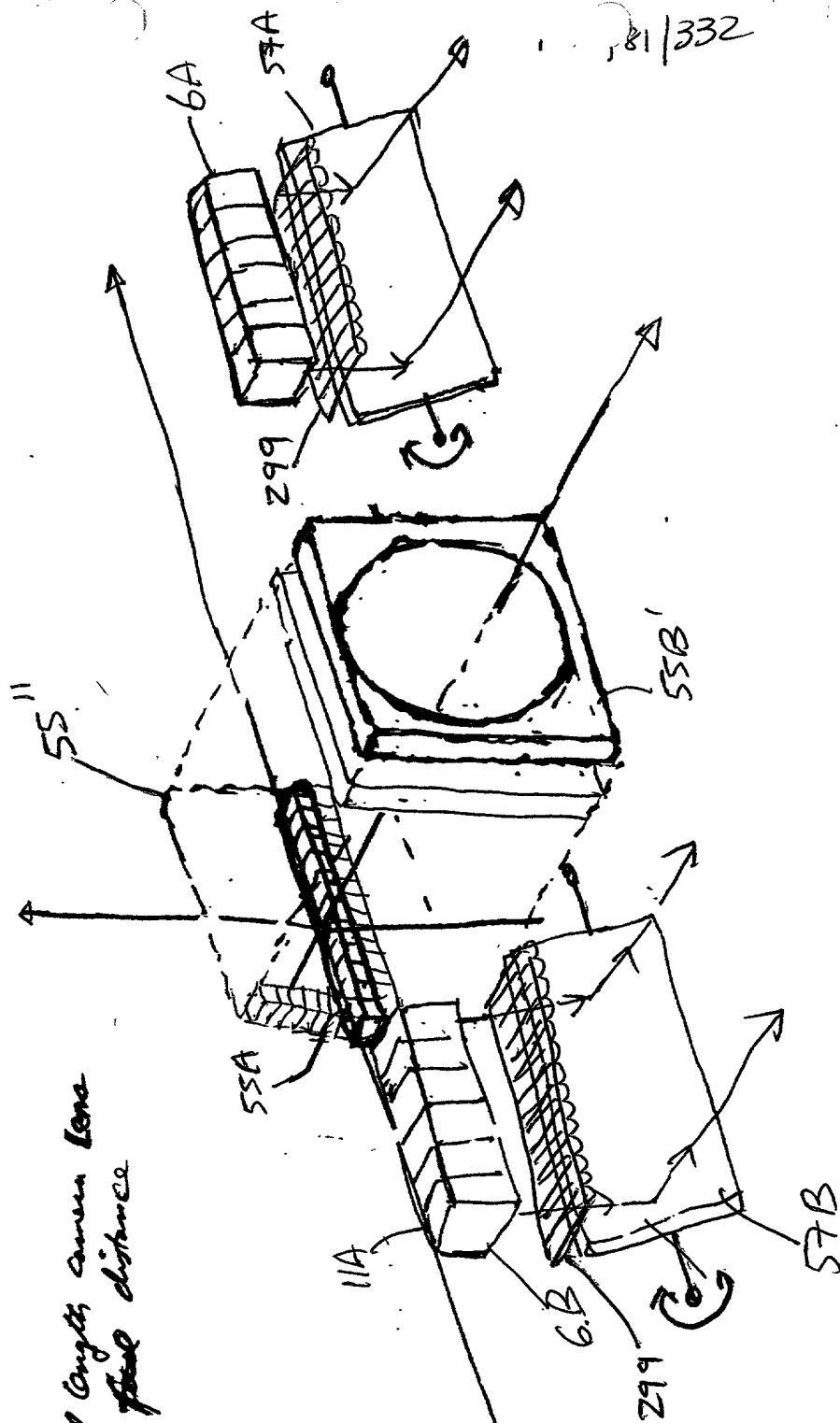


FIG. 6B1

- (1) Variable focal length camera lens
- (2) Variable focal distance



30A

FIG. 6B2

81/332



[illegible]

FIG. 6B3

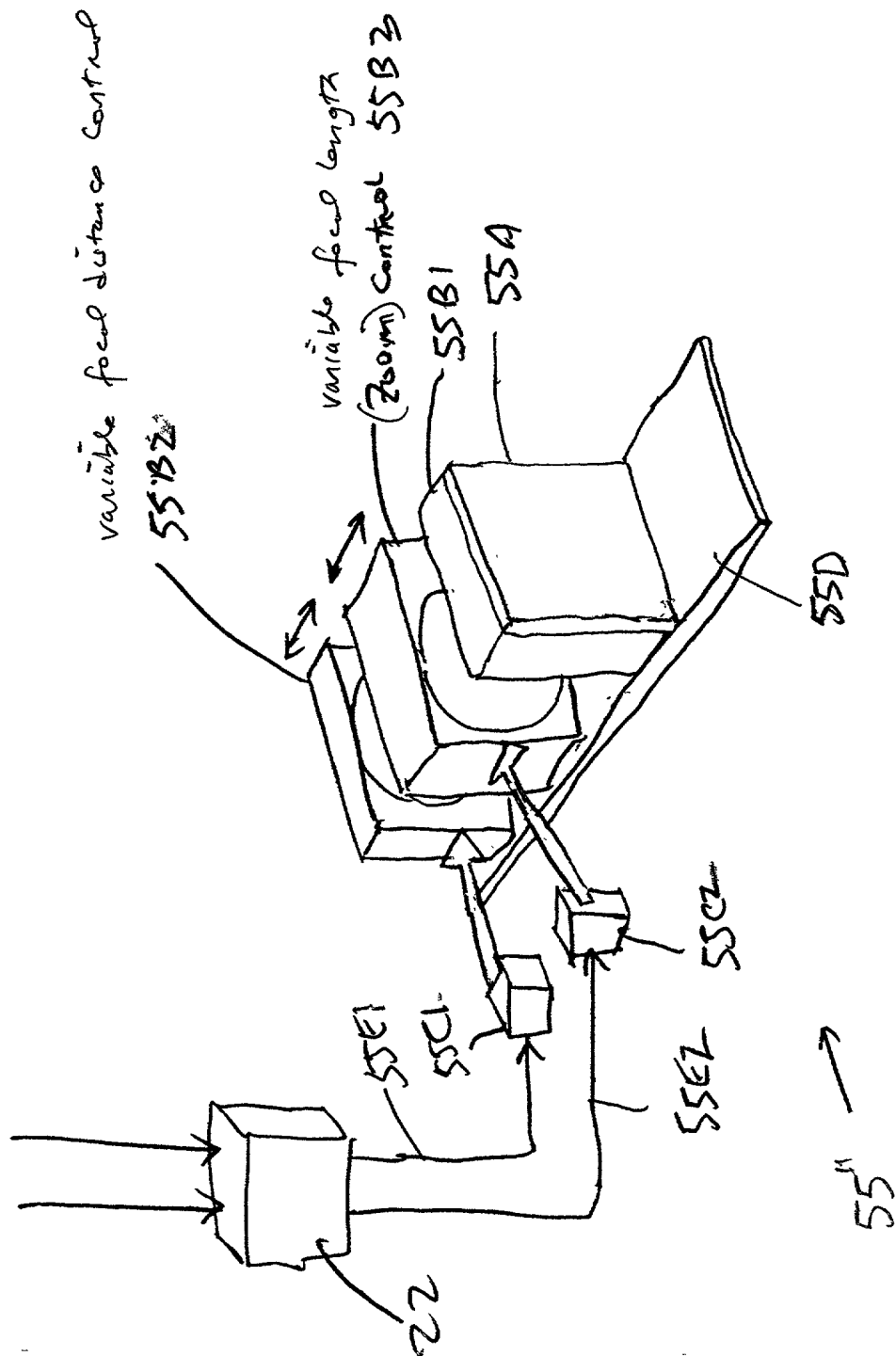


FIG. 6B4

295

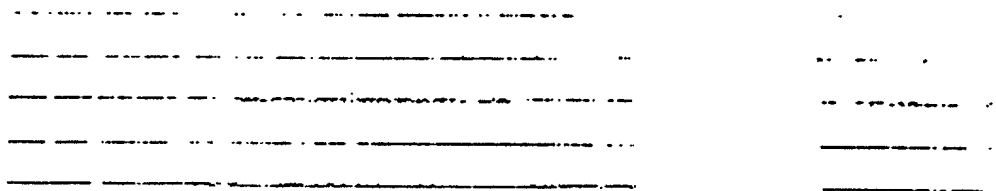
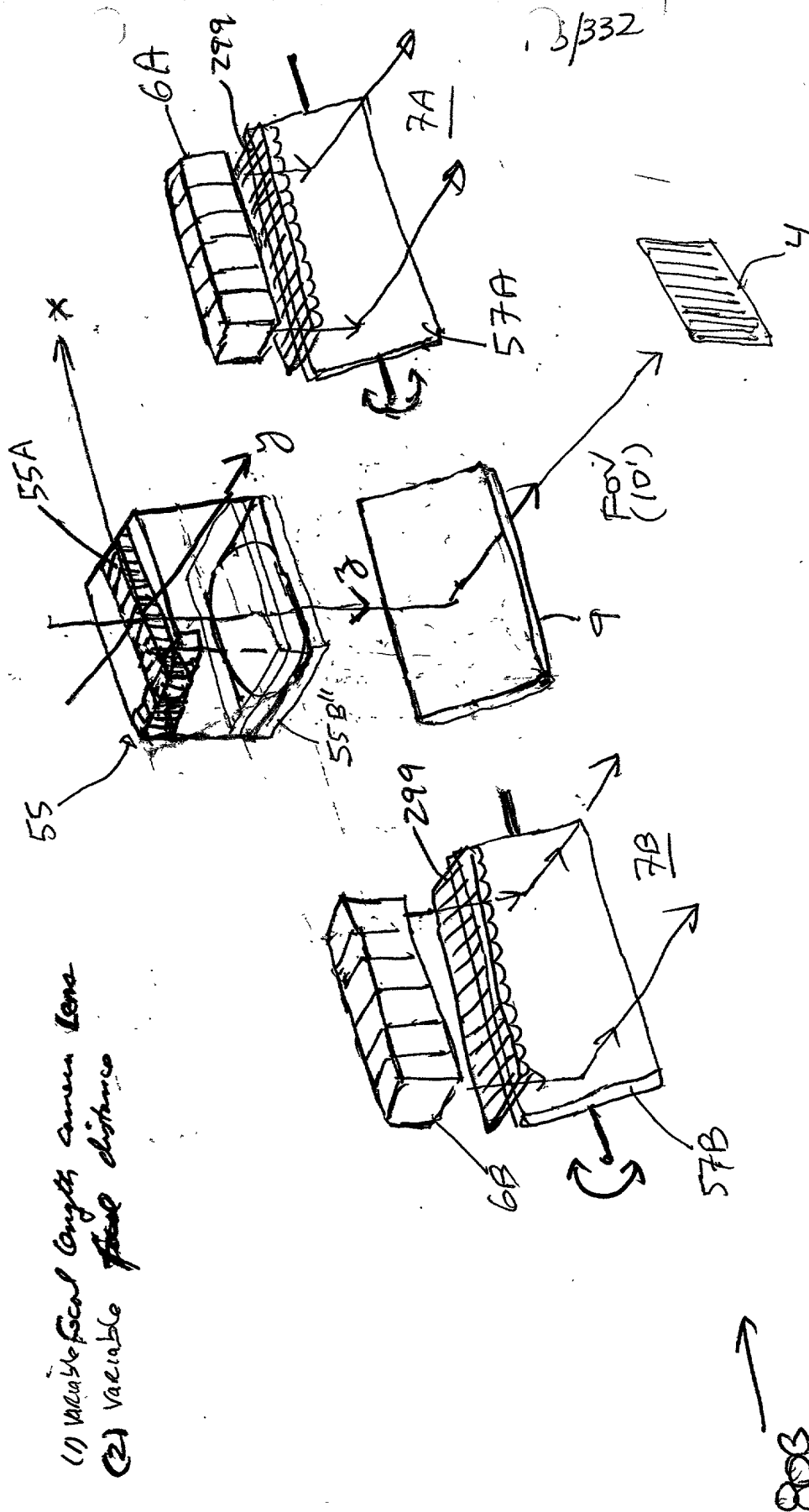


FIG. 6C1



- (1) Variable focal length camera lens
- (2) Variable focal distance

FIG. 6C2

186/332

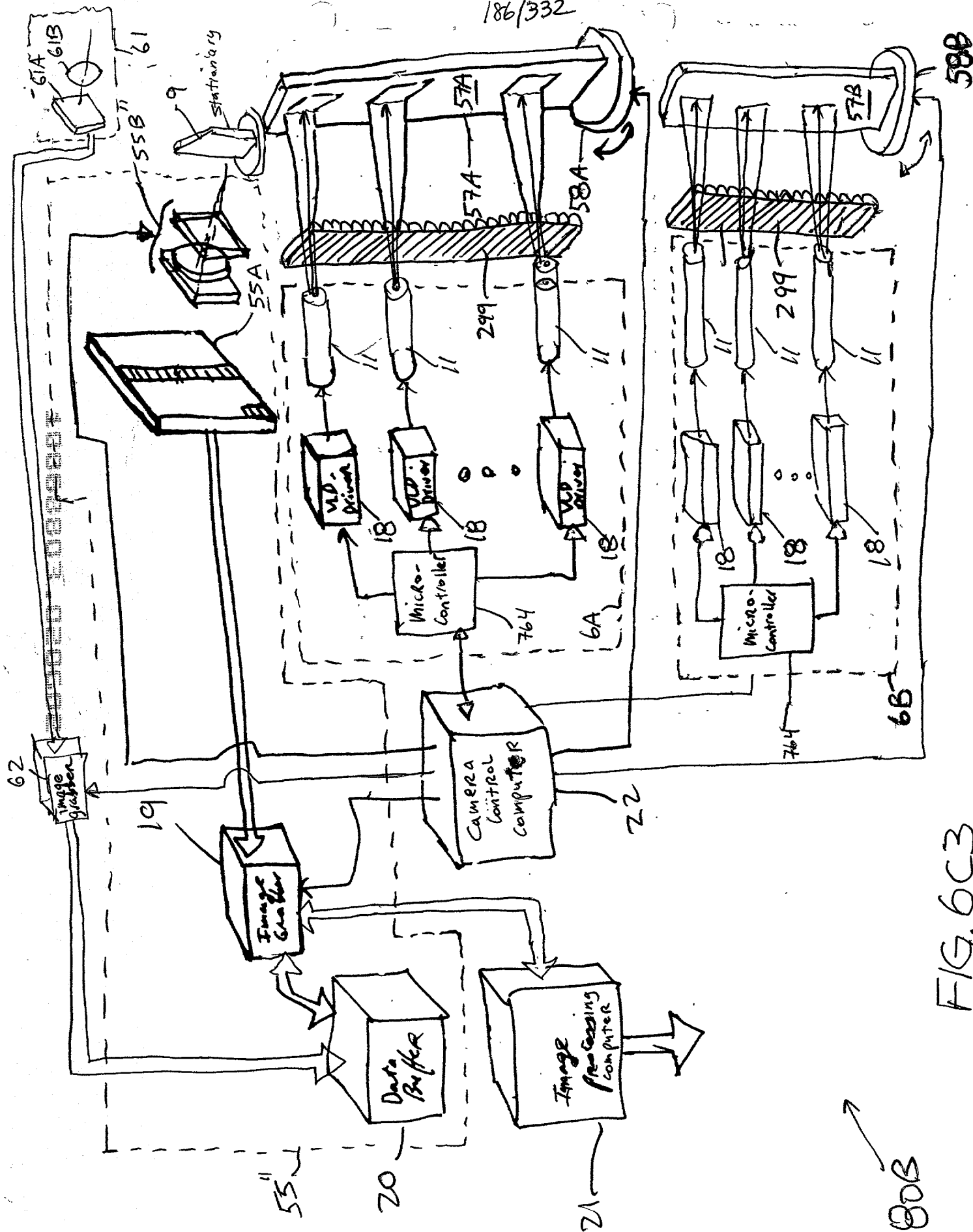


FIG. 6C3



FIG. 6C4

188/332

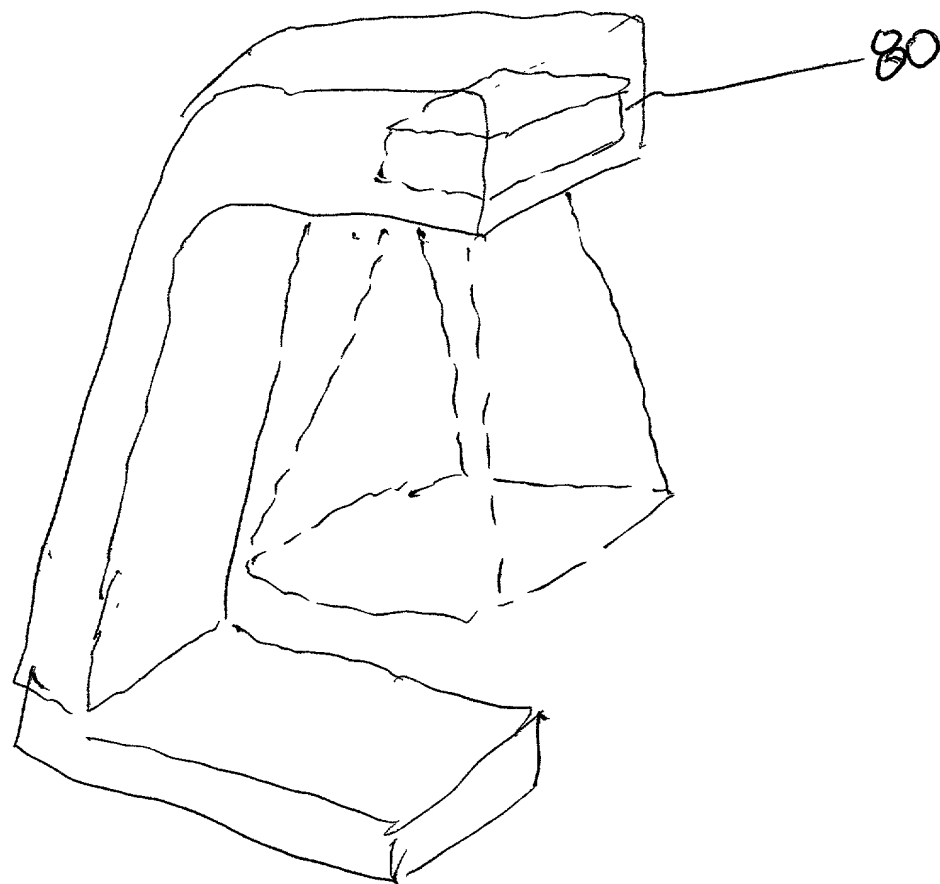


FIG. 6C5

10068803-020602

10068803.020602

189/332

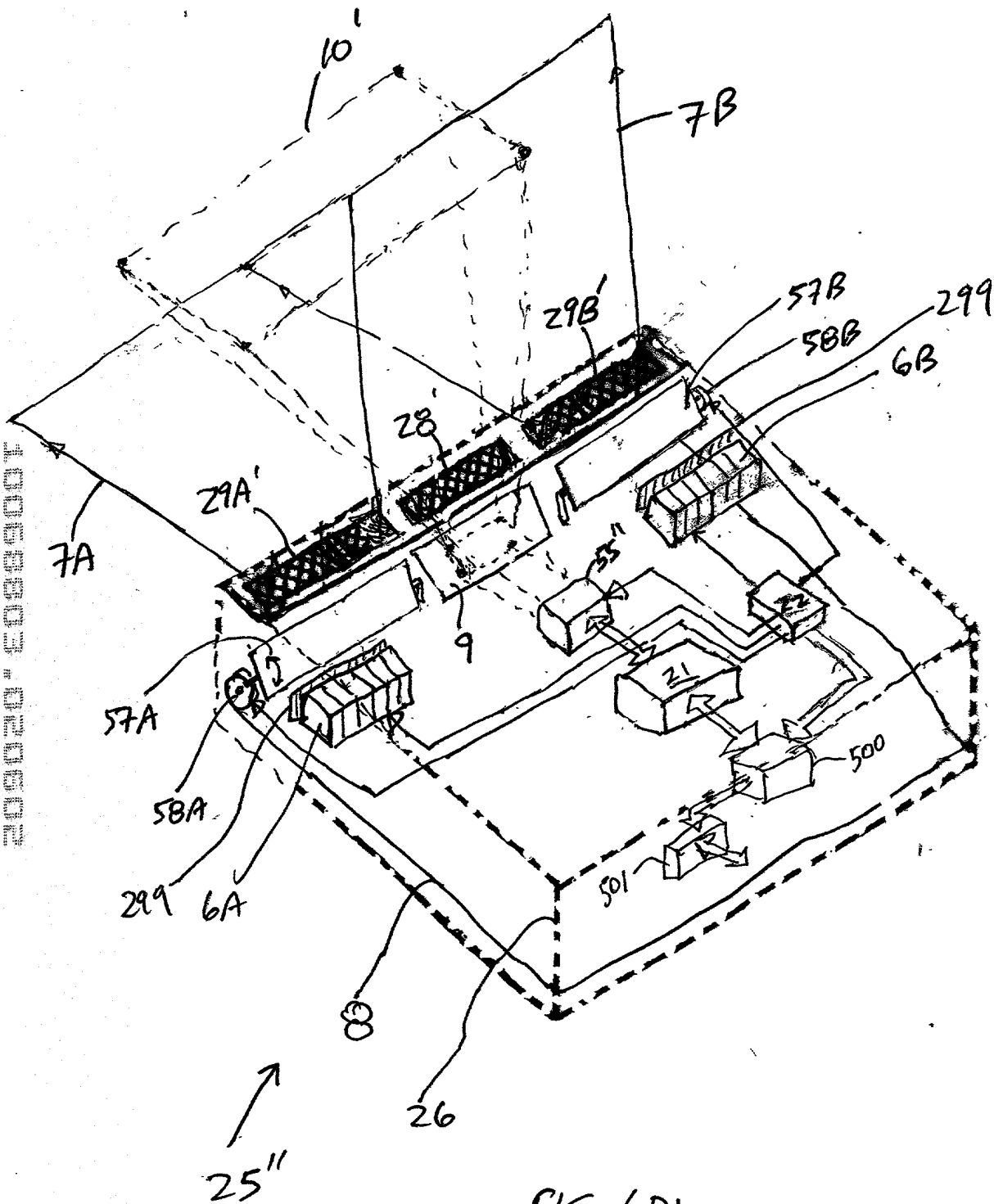


FIG. 6D1



190/332

10068803.020602

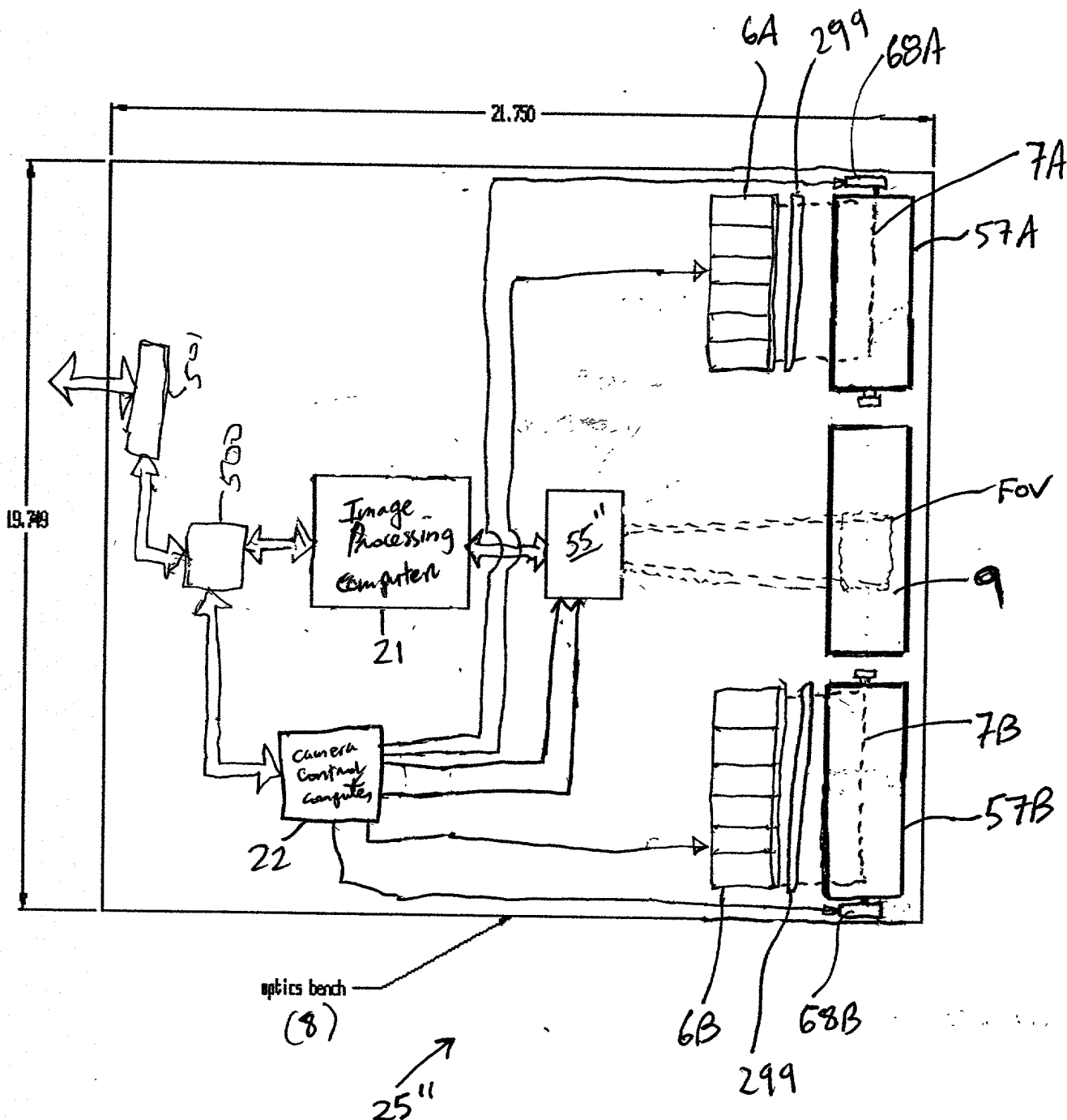


FIG. 6DZ

191/332

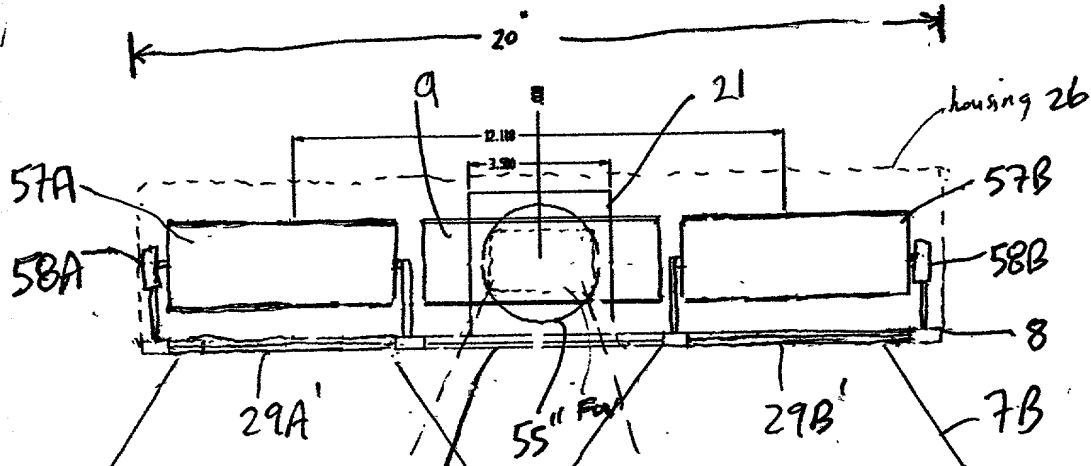


FIG. 6D3

Stationary  
3-D  
FOV

192/332

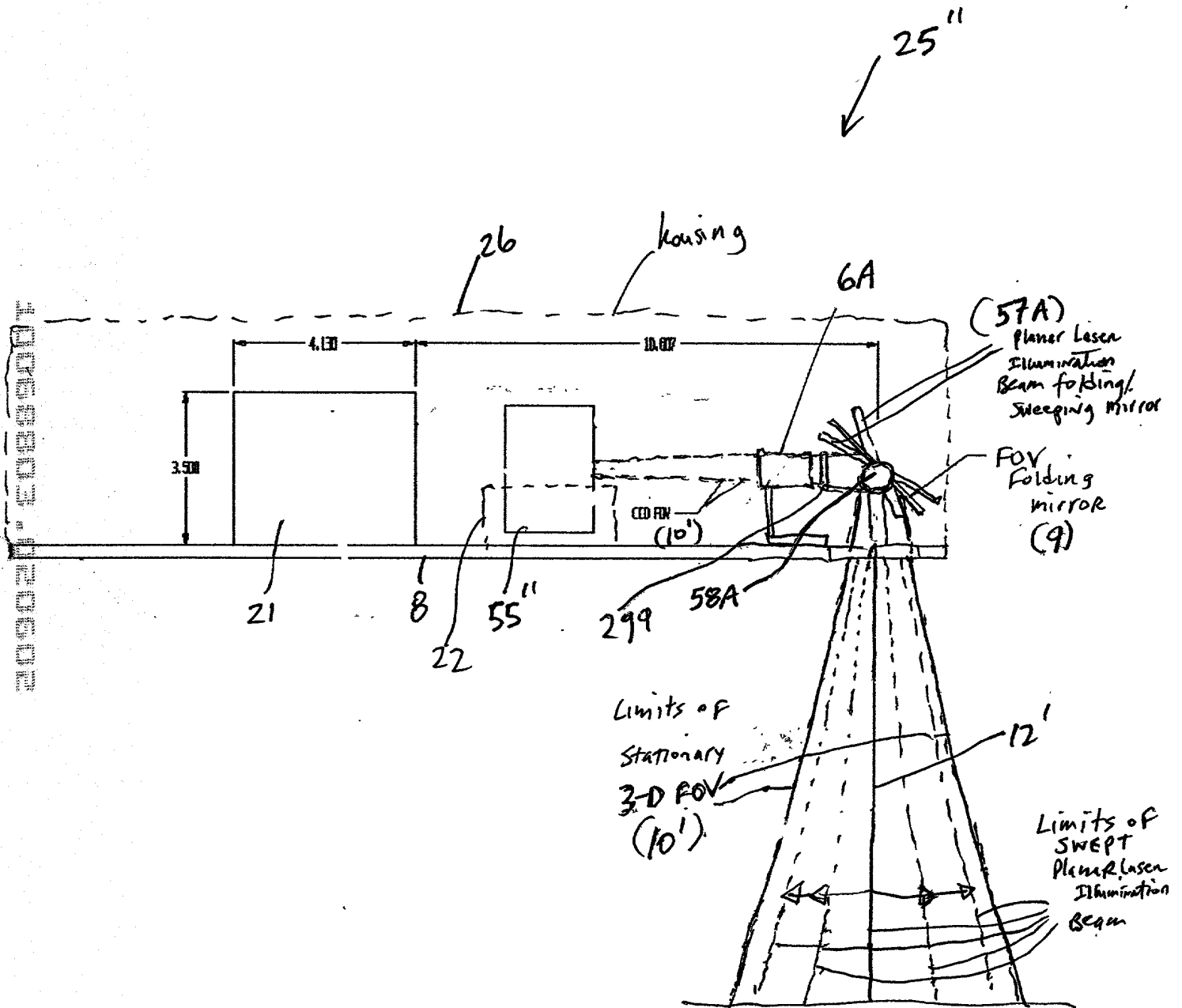


FIG. 6D4

193/332

variable FOV

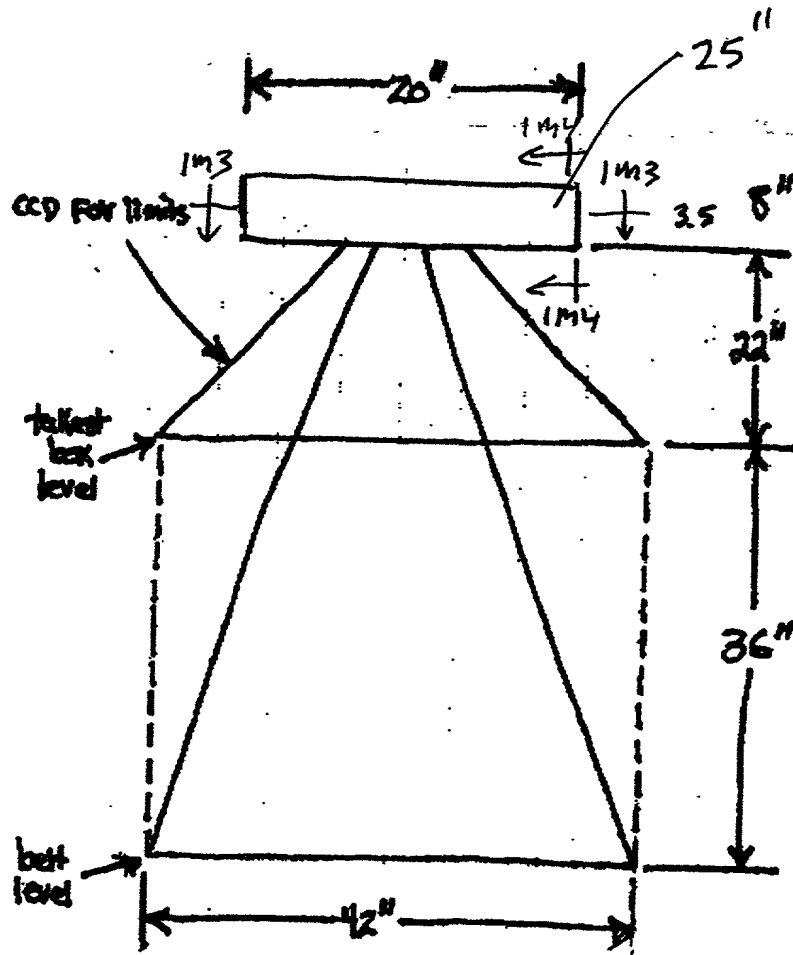


FIG. 6D5

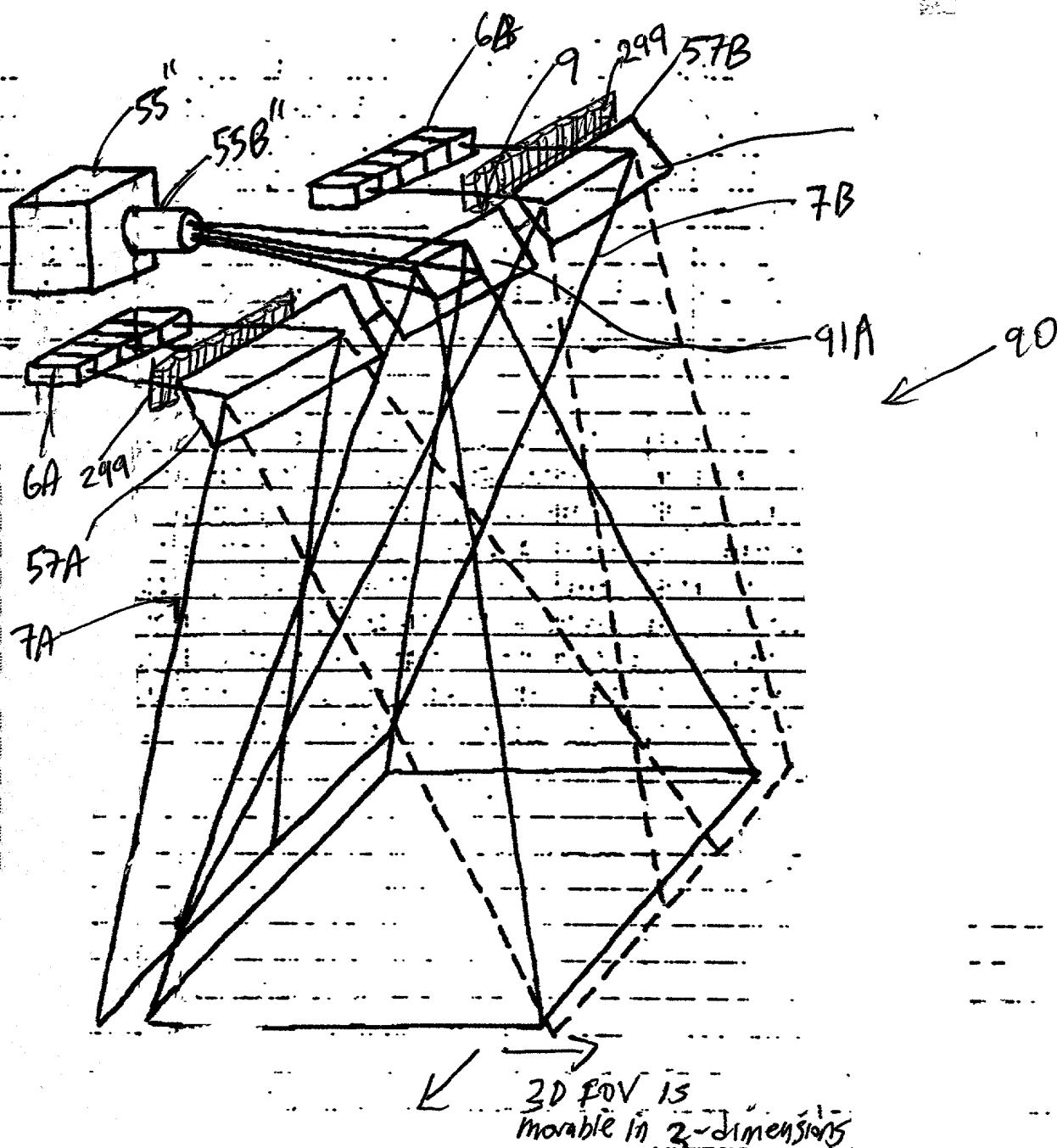
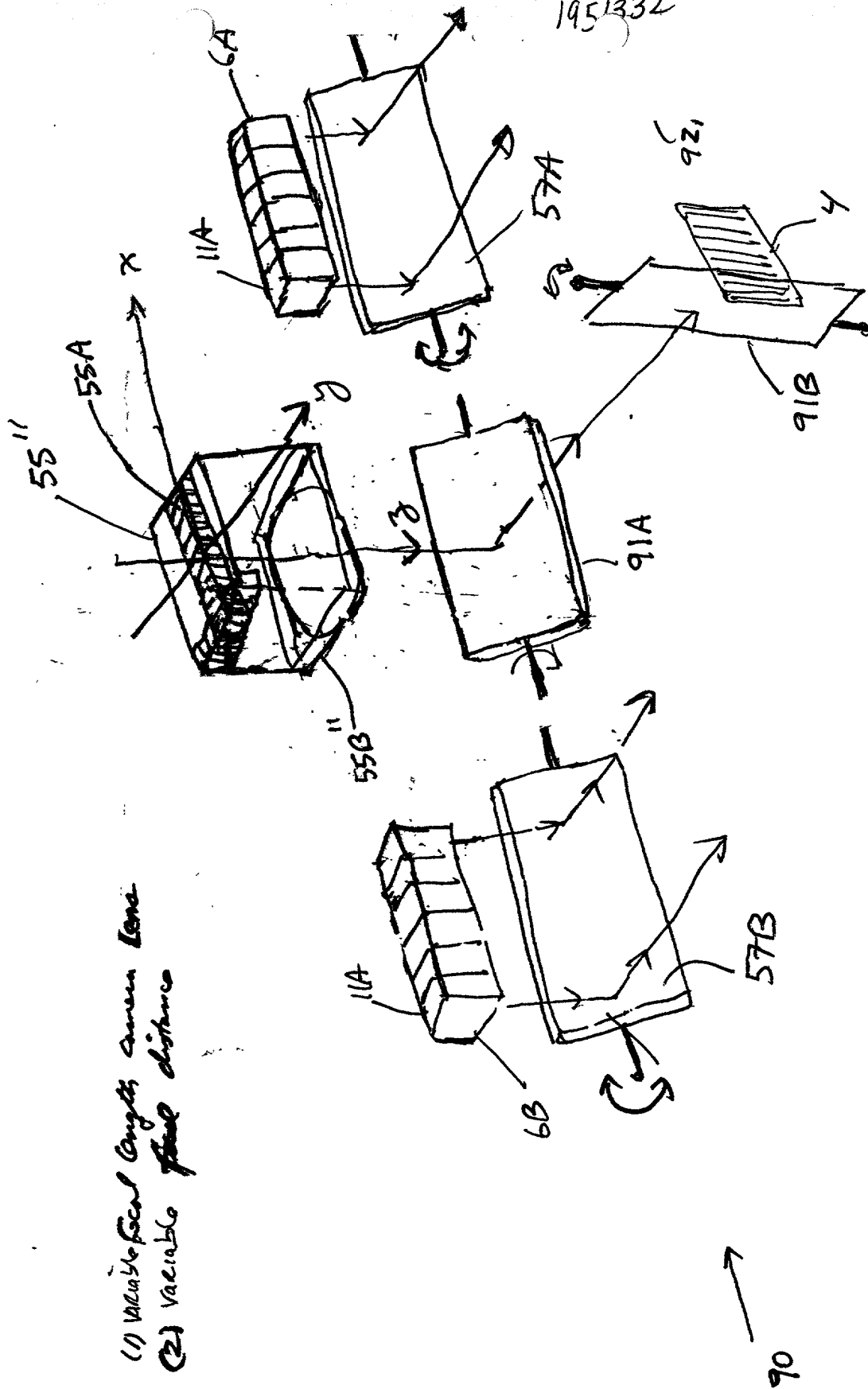


FIG. 6E1

195/332



- (1) Variable focal length camera lens
- (2) Variable field distance

FIG. 6E2

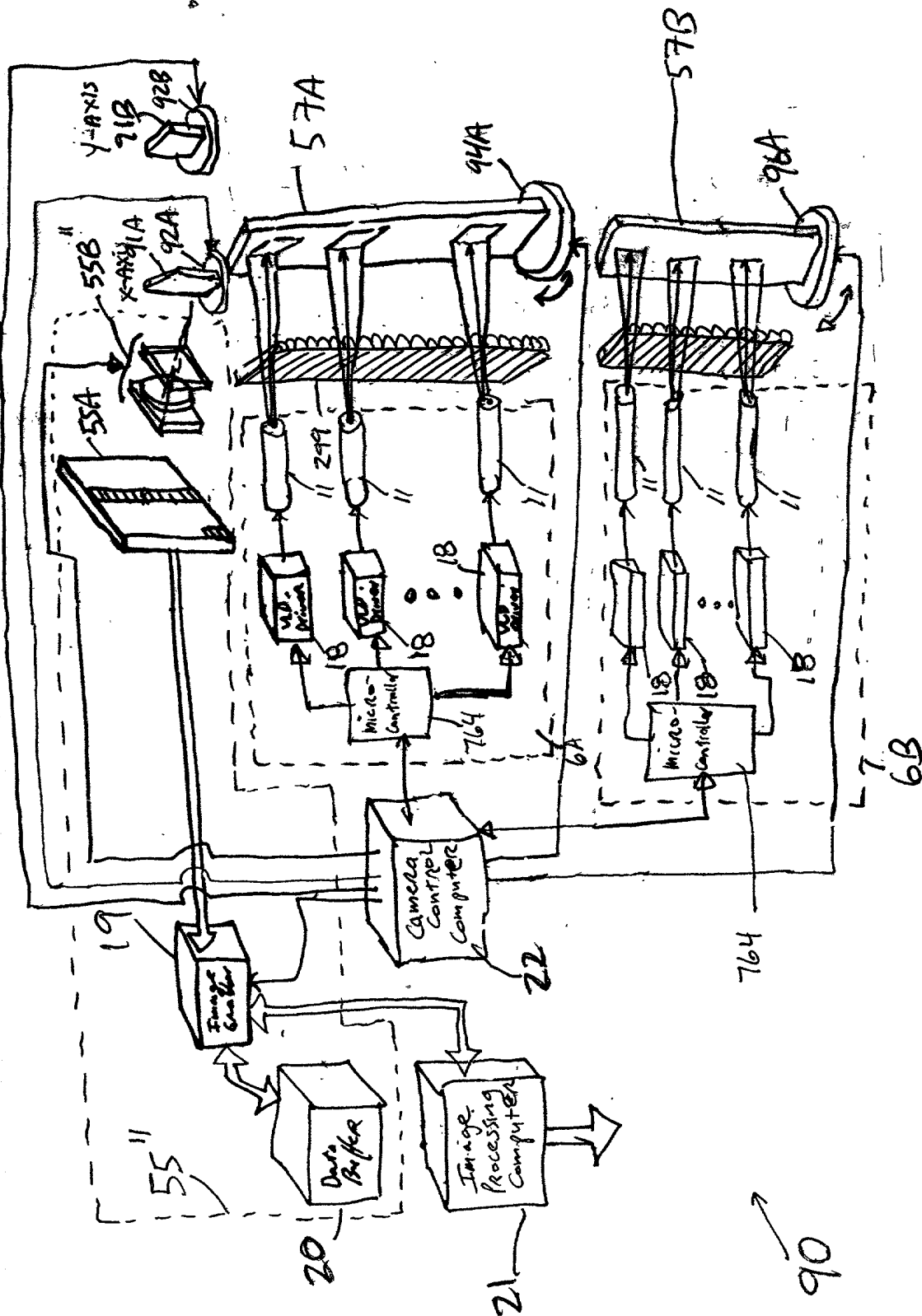


FIG. 6E3

197/332

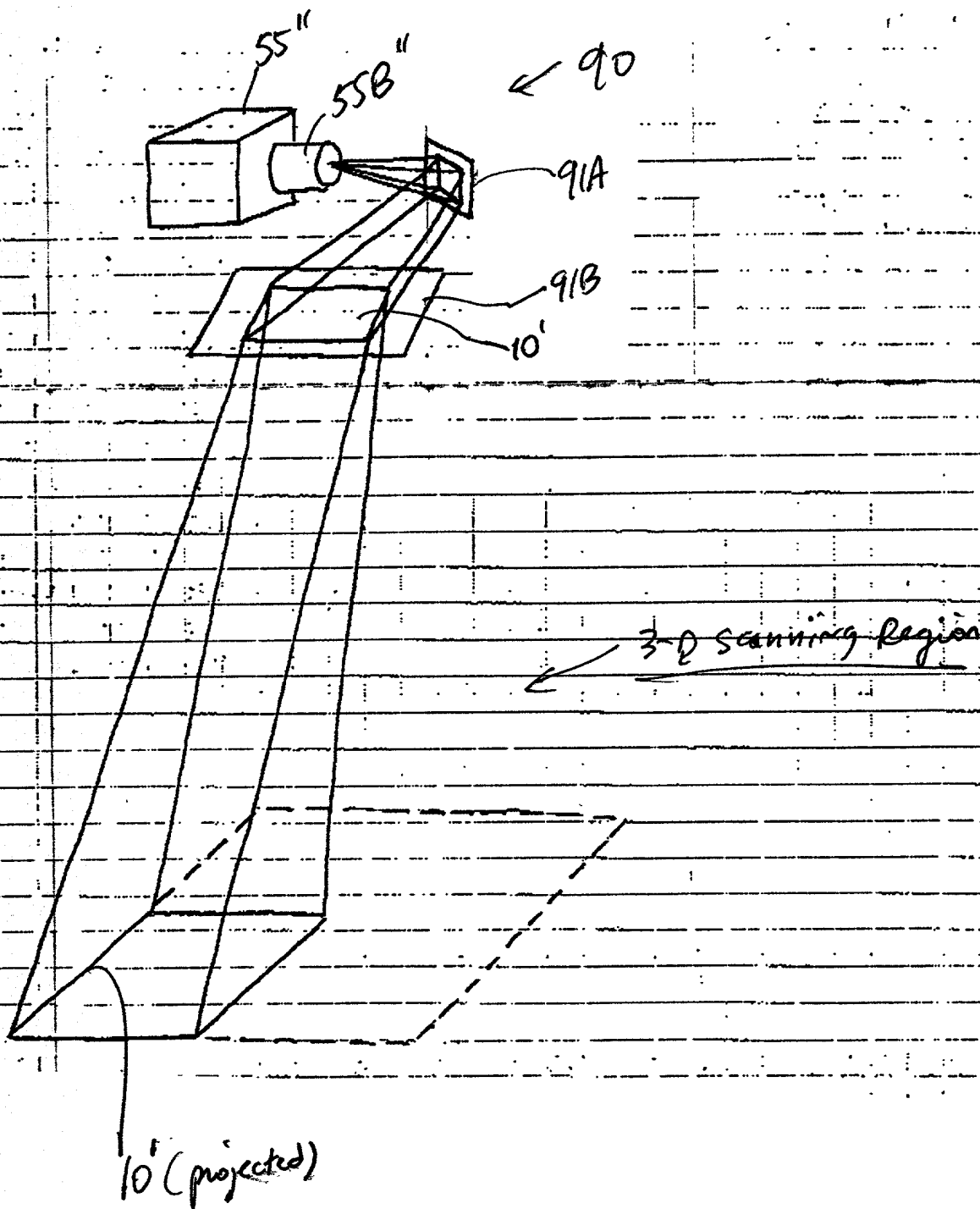
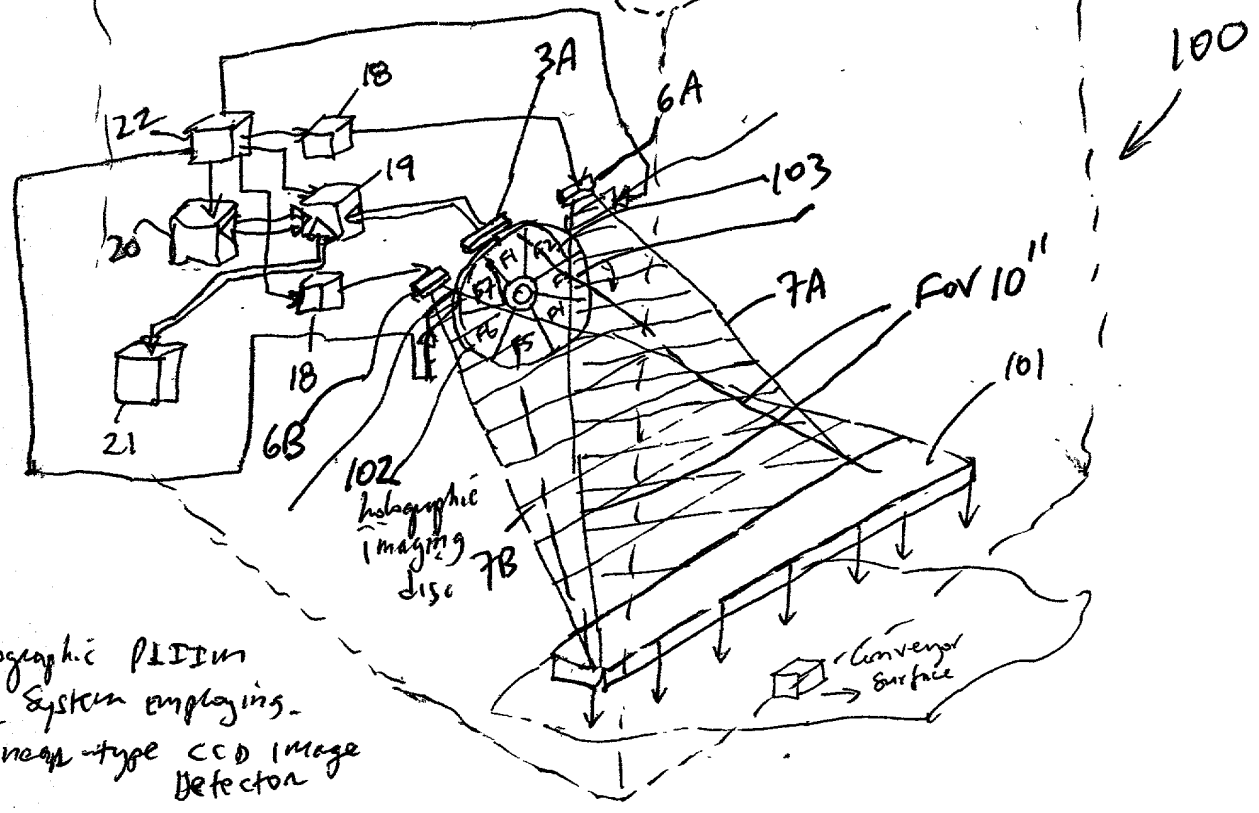


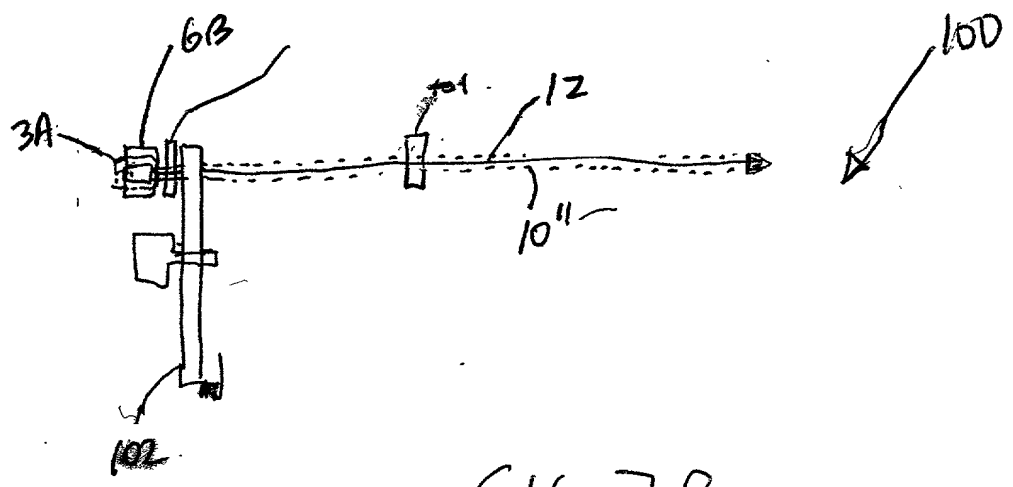
FIG. 6E4



10068803-020602



Holographic PLIDIM  
System employing  
Linear-type CCD Image  
Detector



199/332

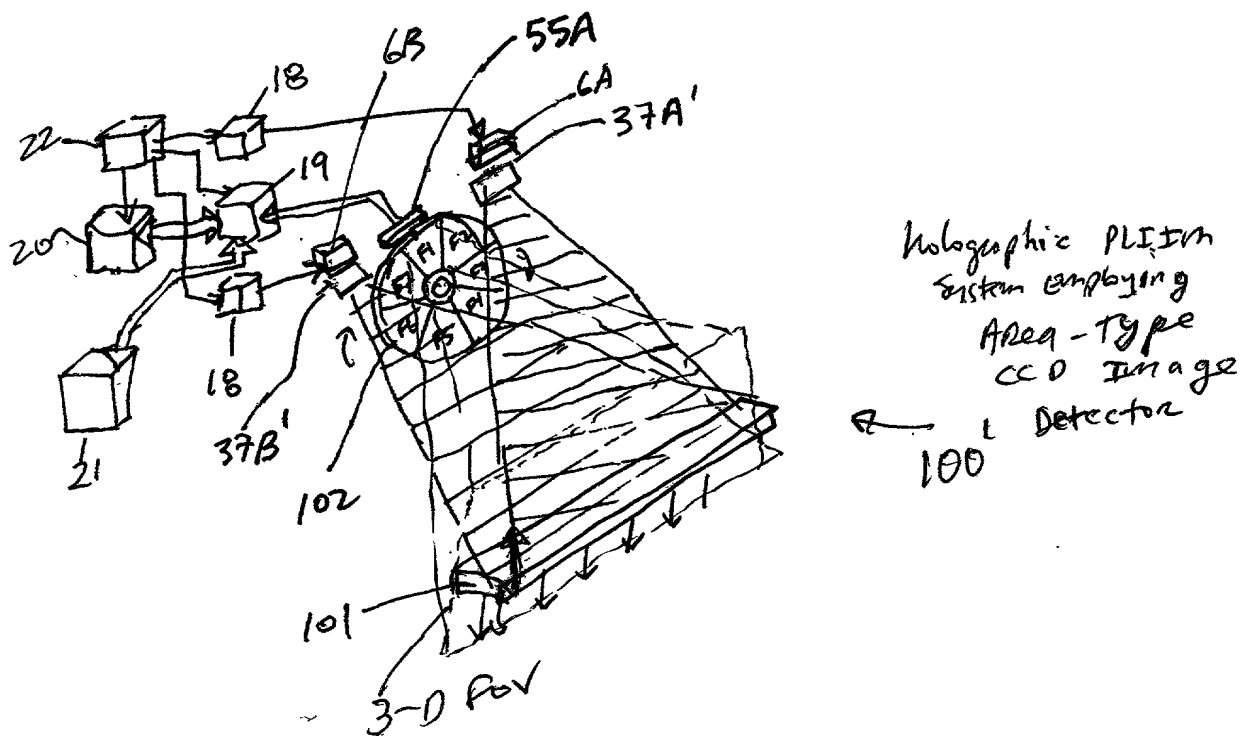


FIG. 8A

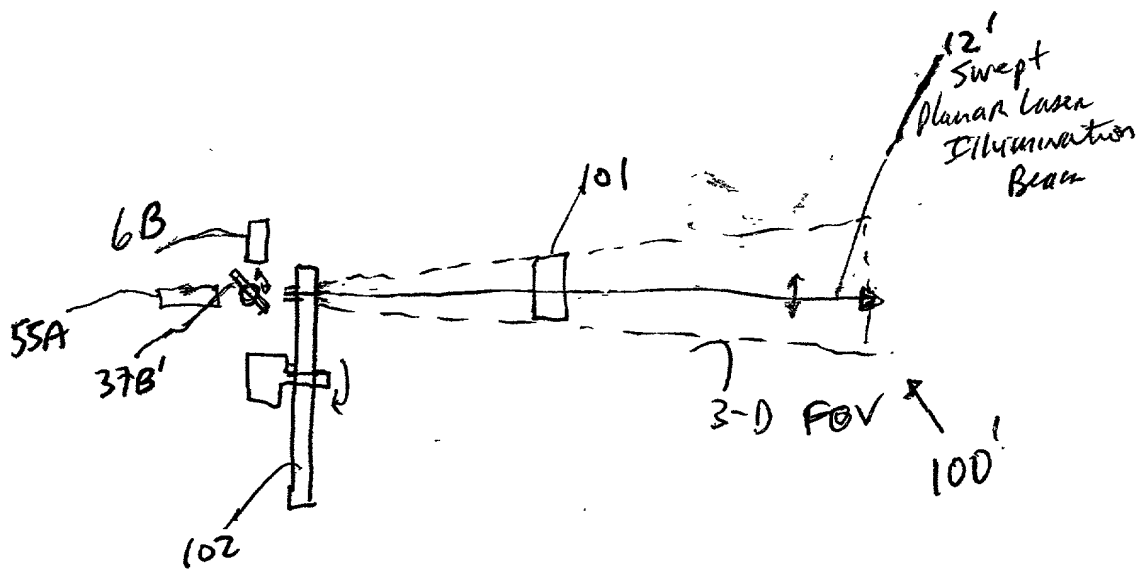


FIG. 8B

10068803-030602

1-D CCD SCANNER EMBODIMENT

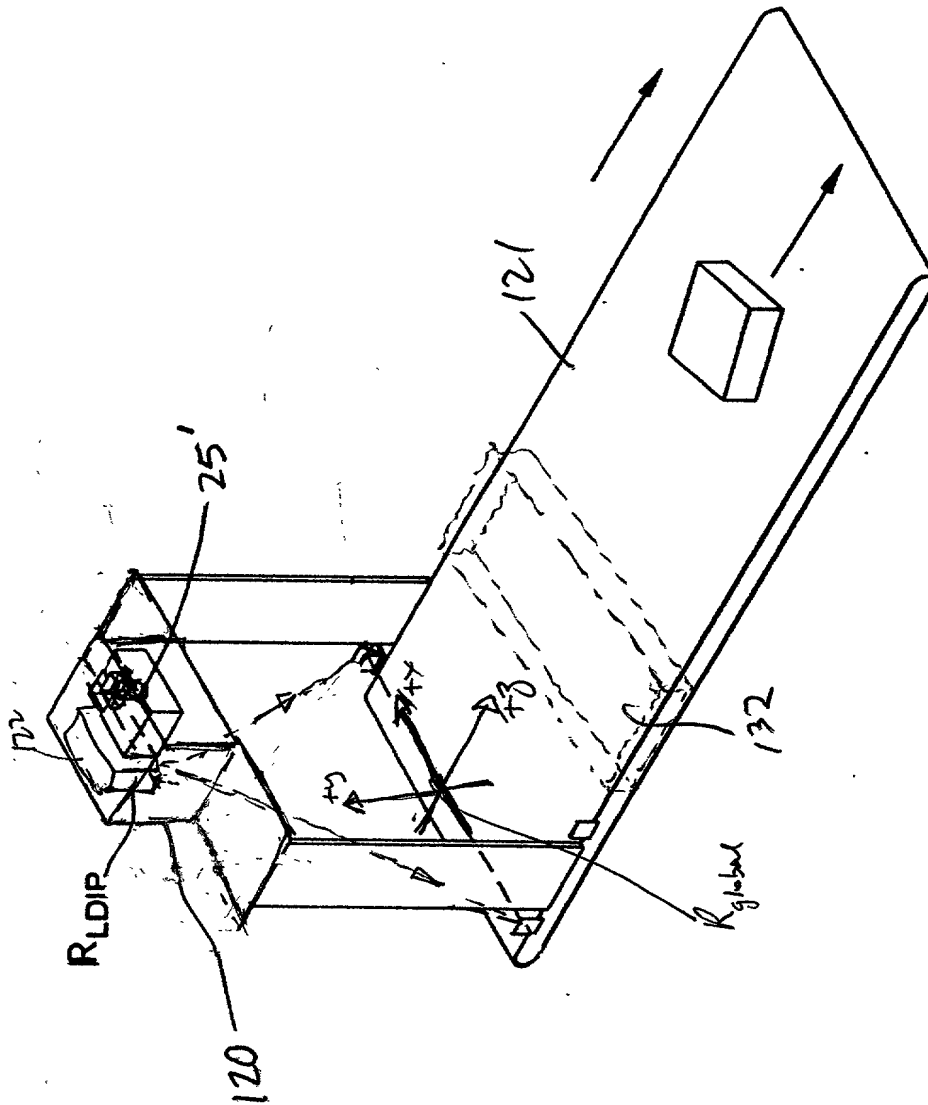


FIG. 9

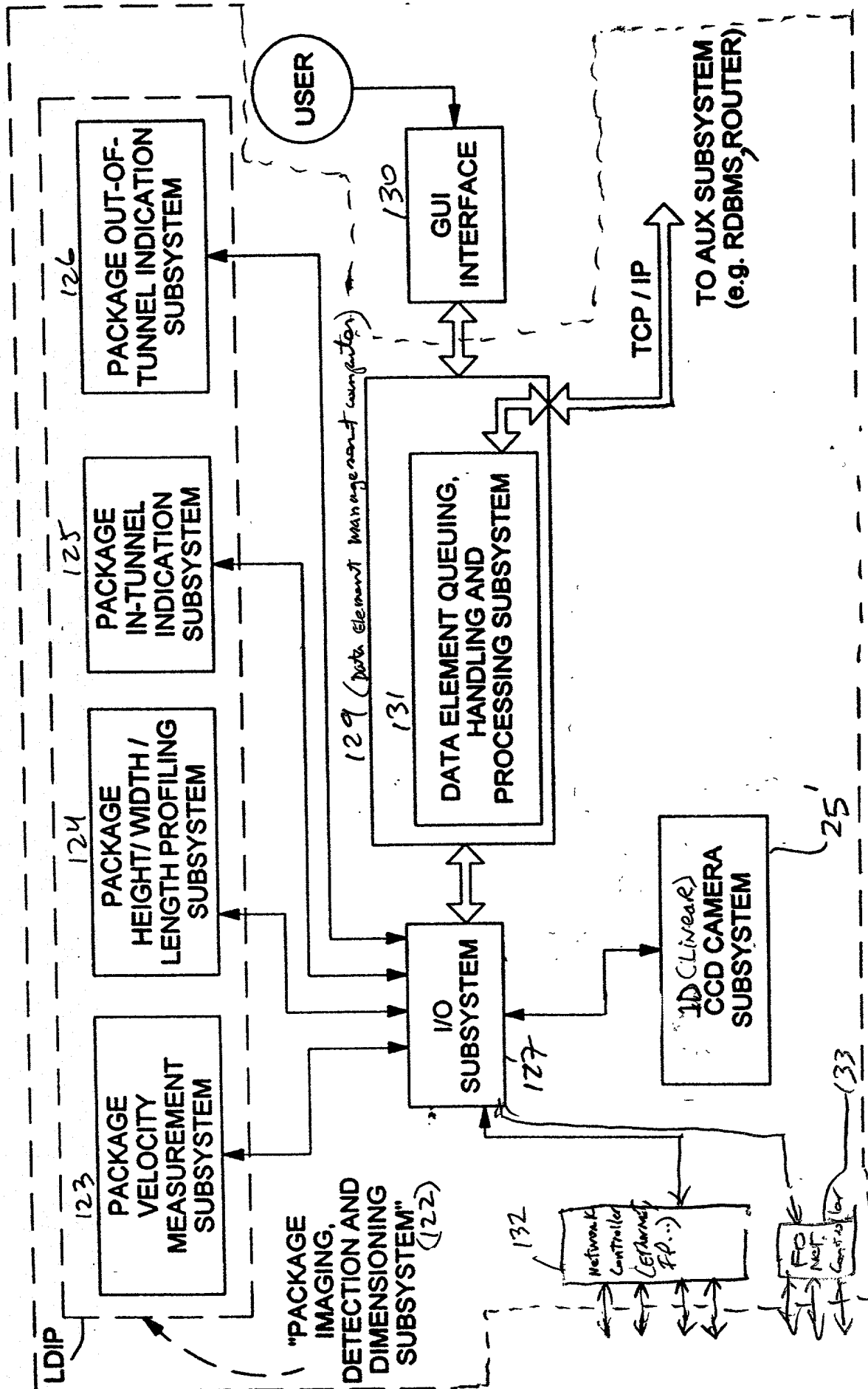


FIG. 10

120

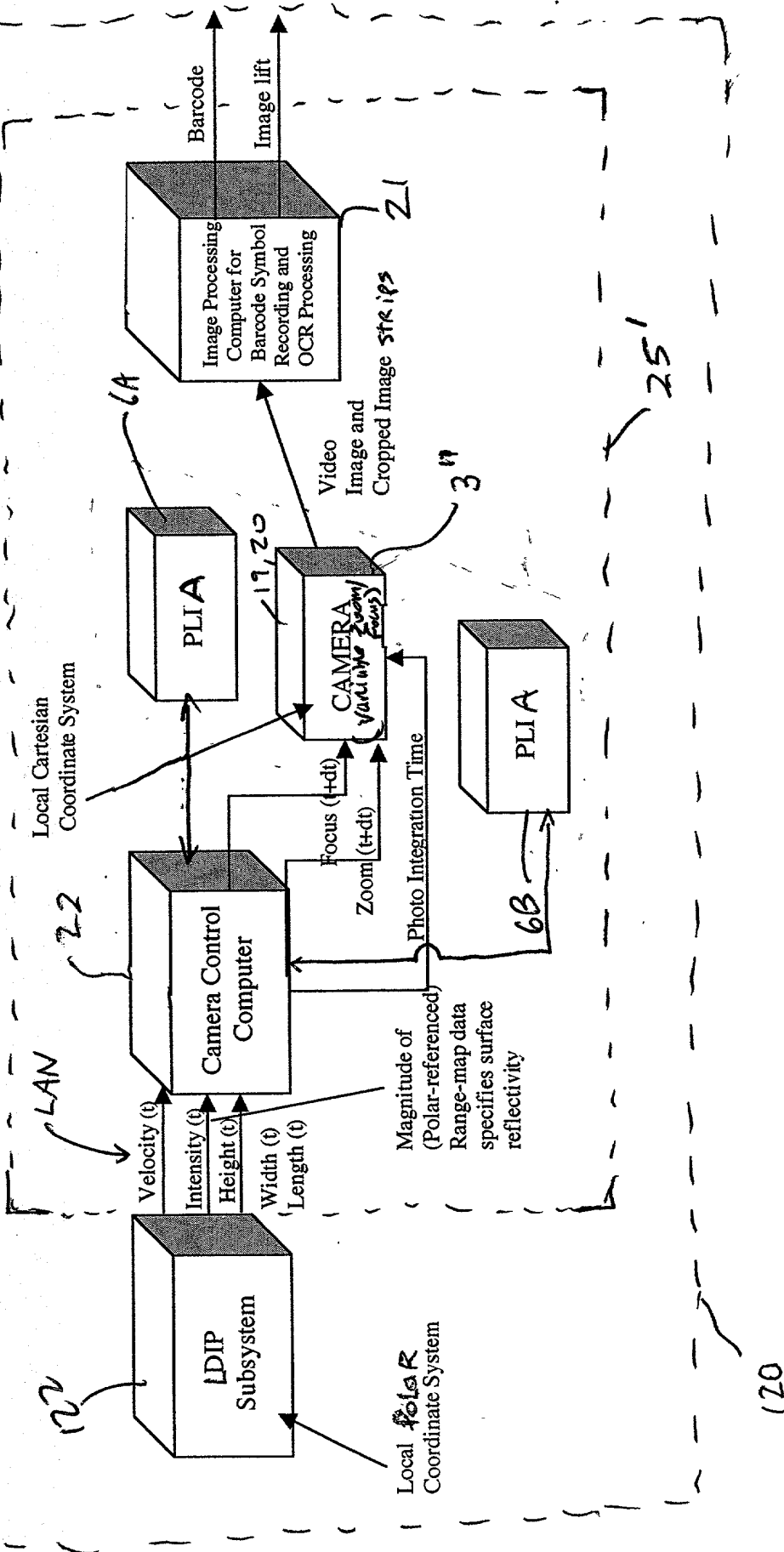


FIG. 11

10000003.020602

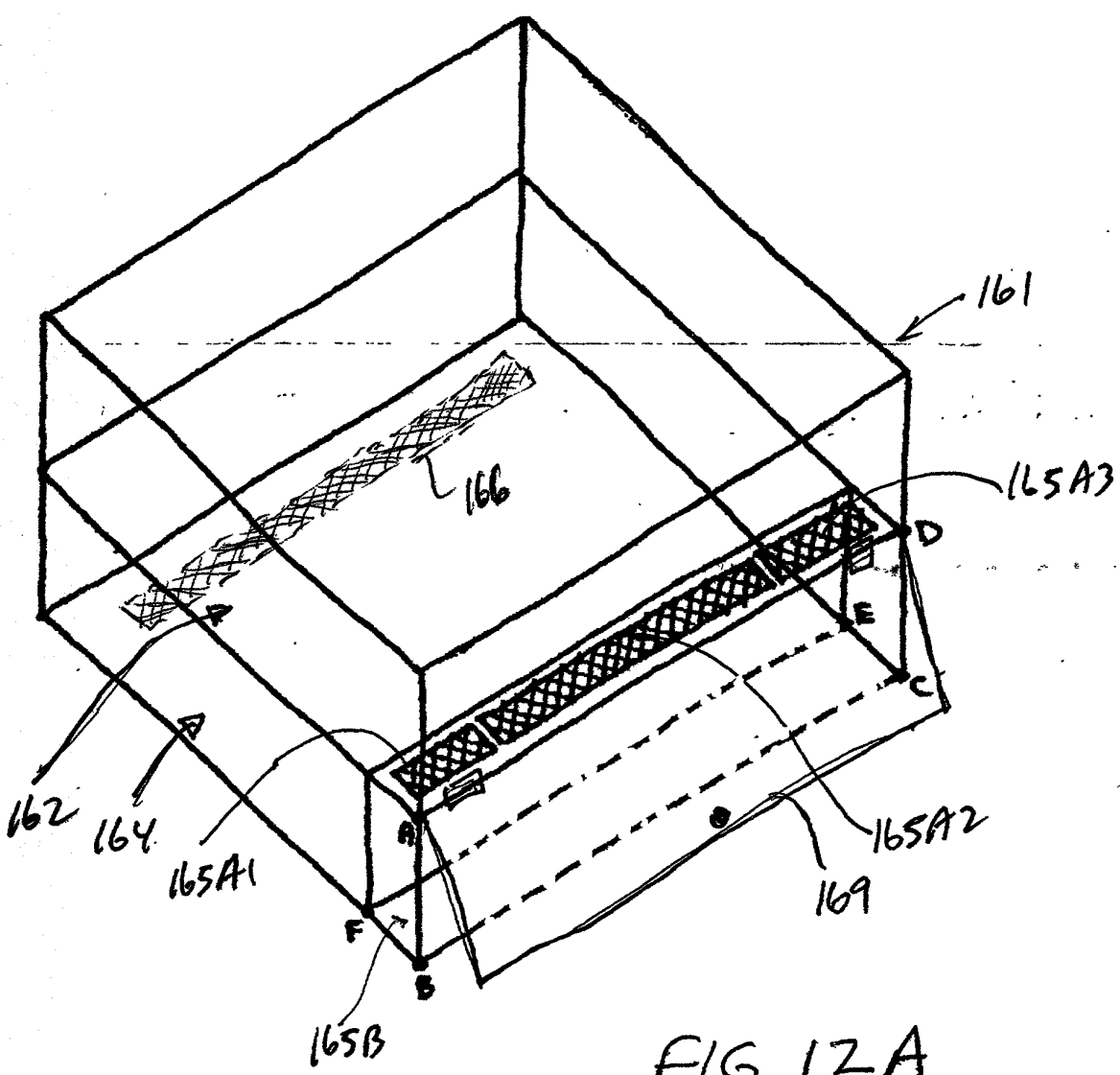


FIG. 12A

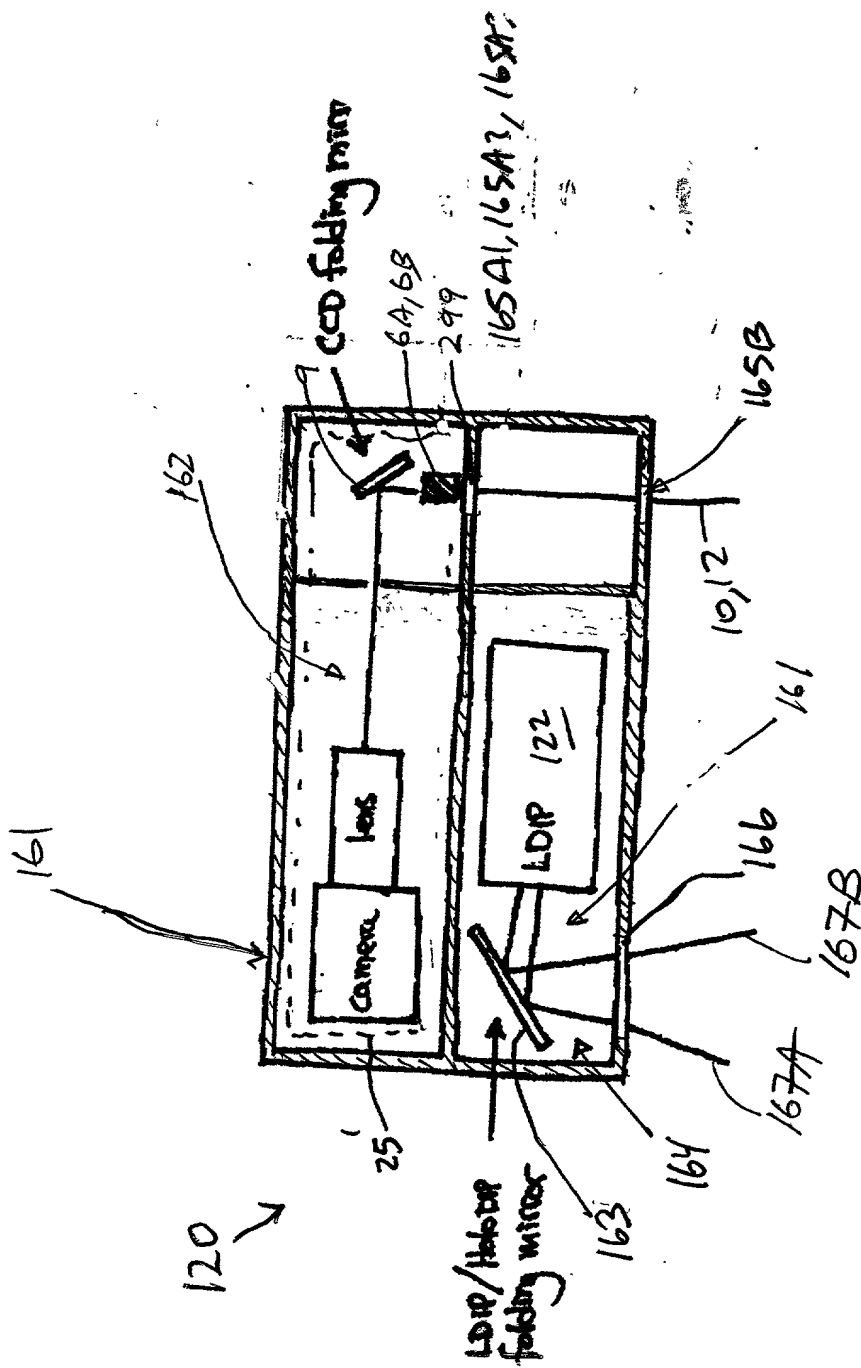


FIG. 12B

205/332

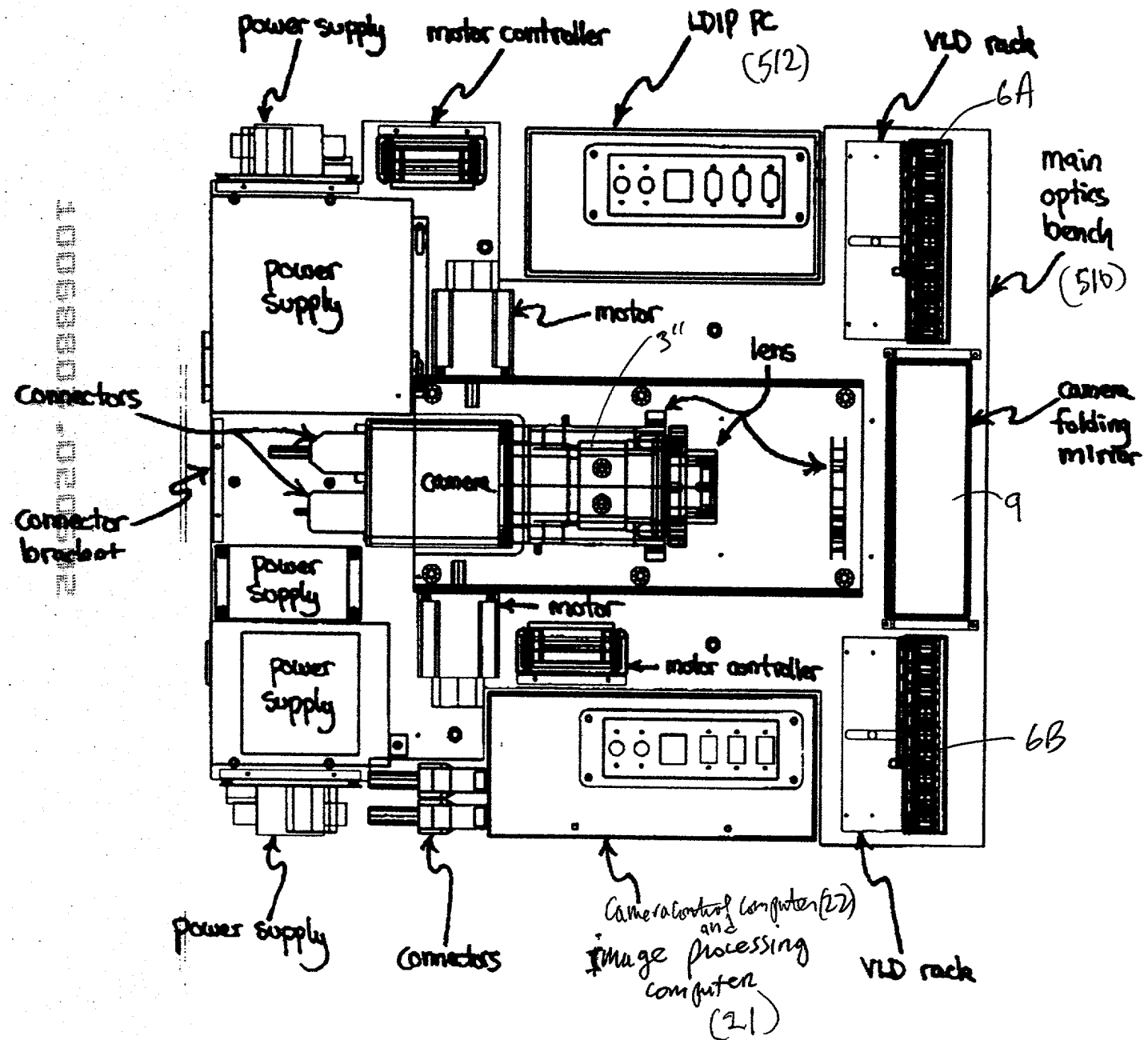


FIG. 12C



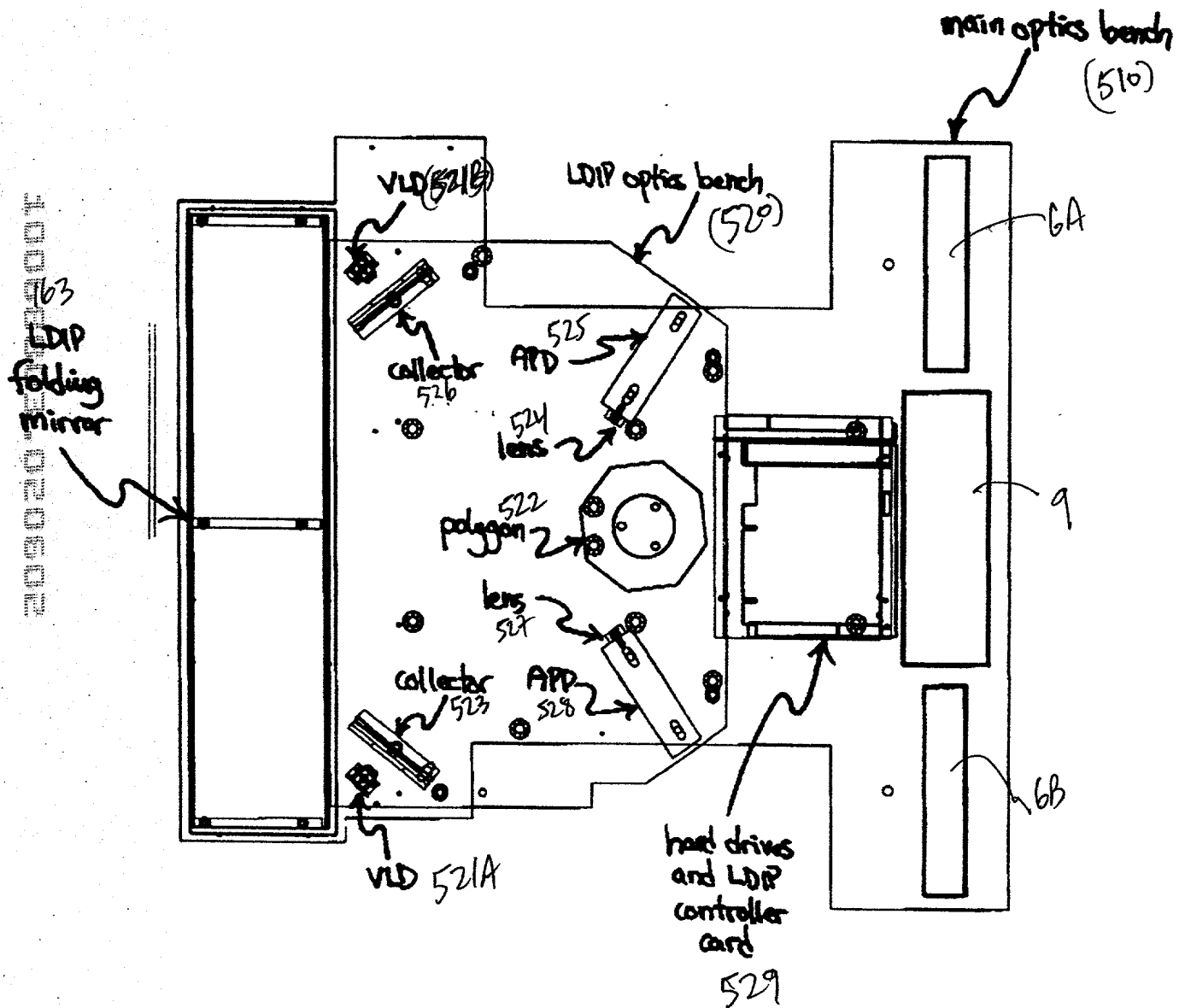
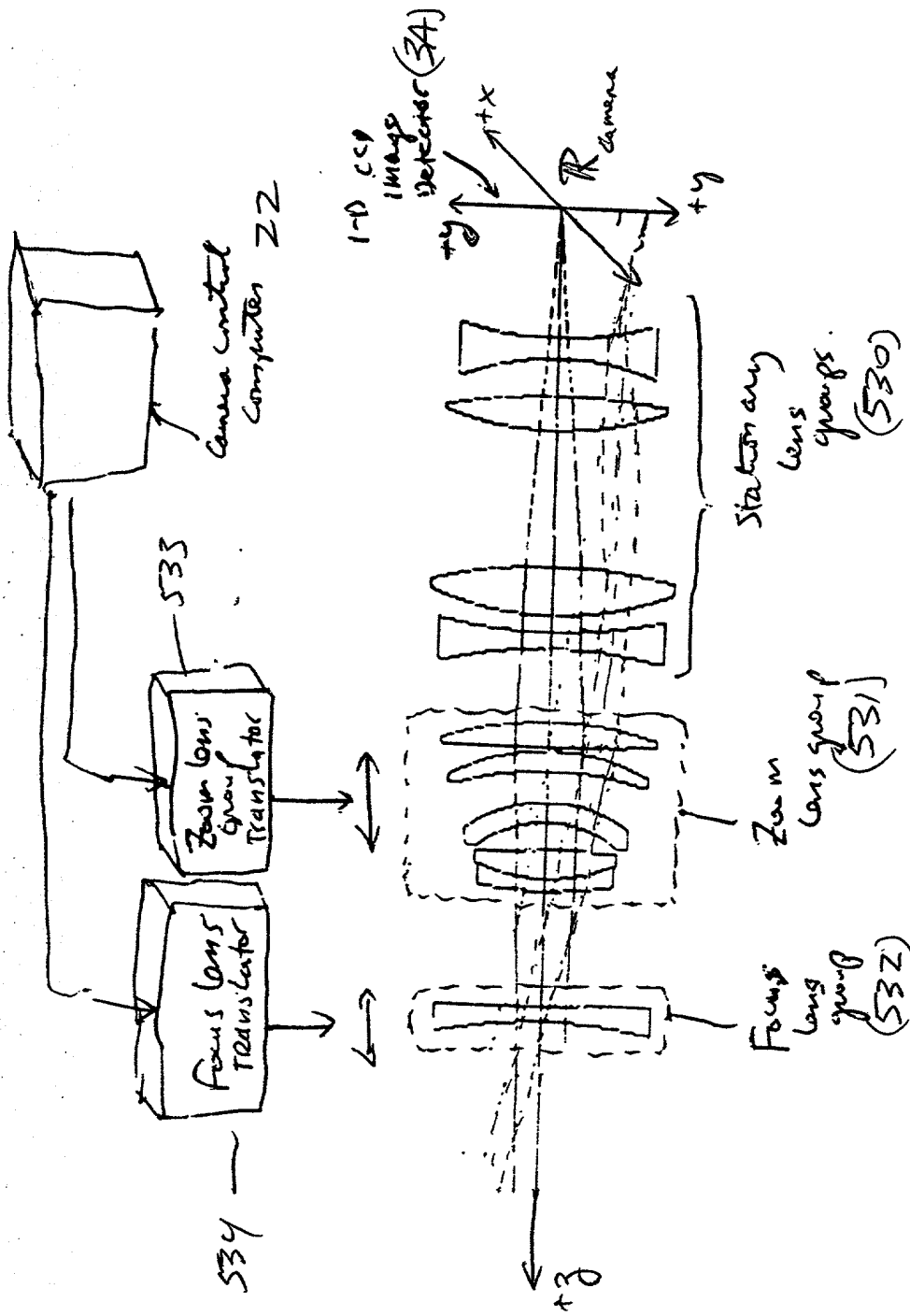


FIG. 12D



(main optics)  
(lens groups)

FIG. 12E

208/332

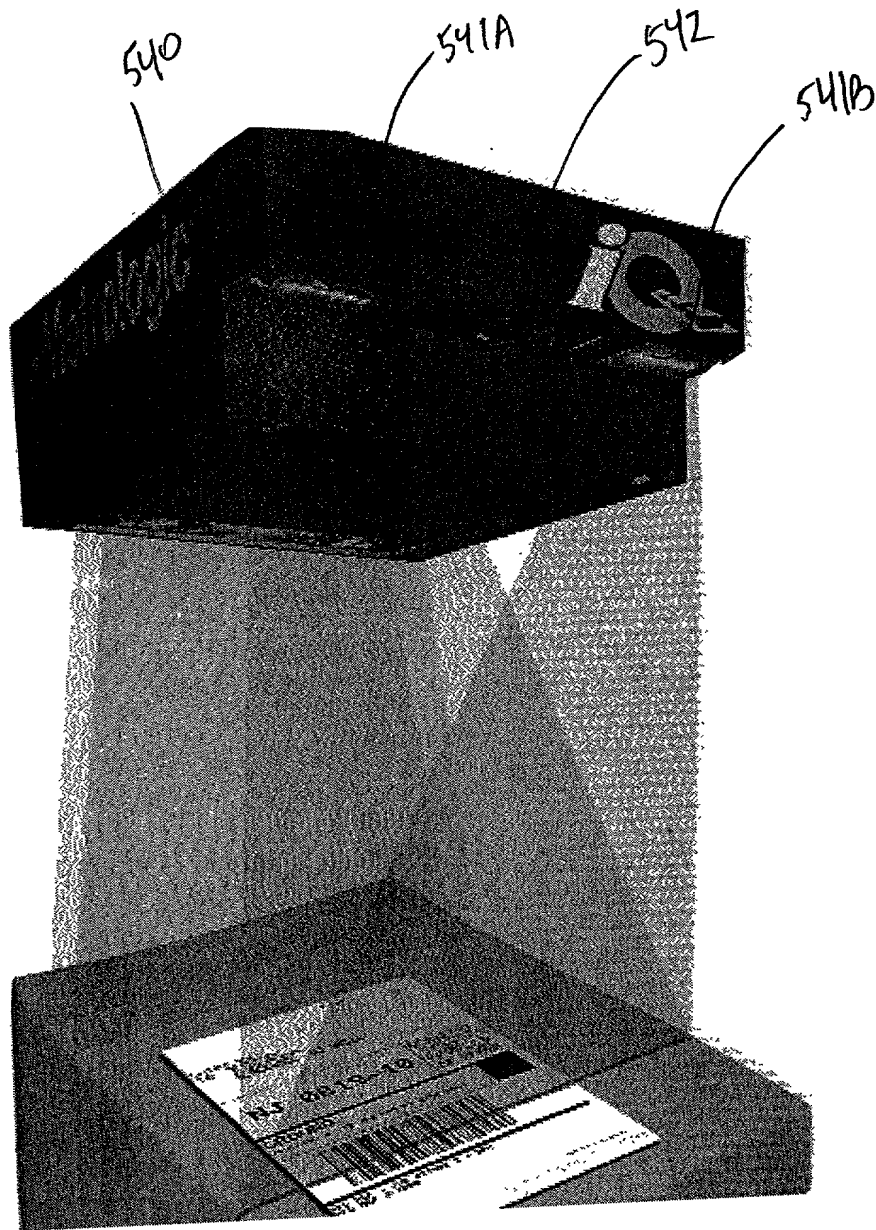


FIG. 13A

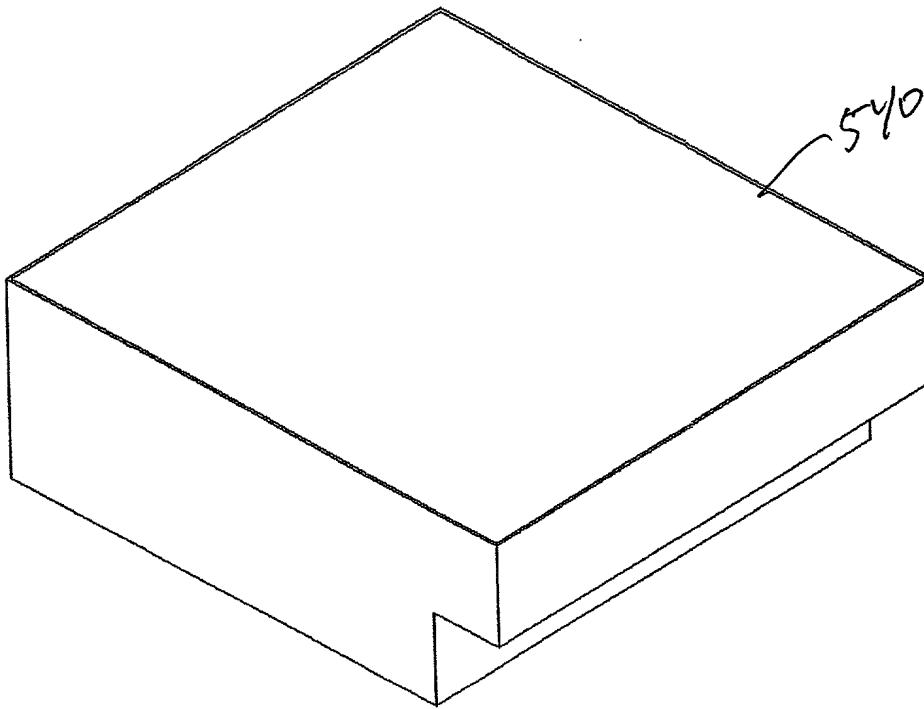


FIG. 13B

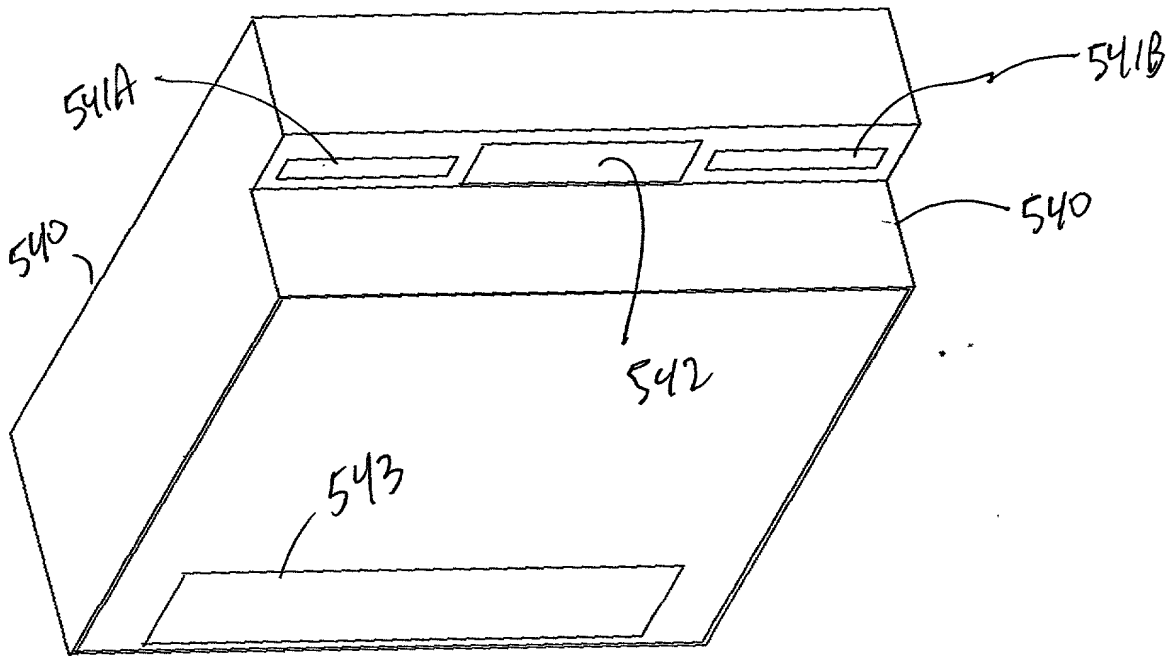


FIG. 13C

210/332

# PLLIM-BASED PACKAGE IDENTIFICATION AND DIMENSIONING (PID) SYSTEM

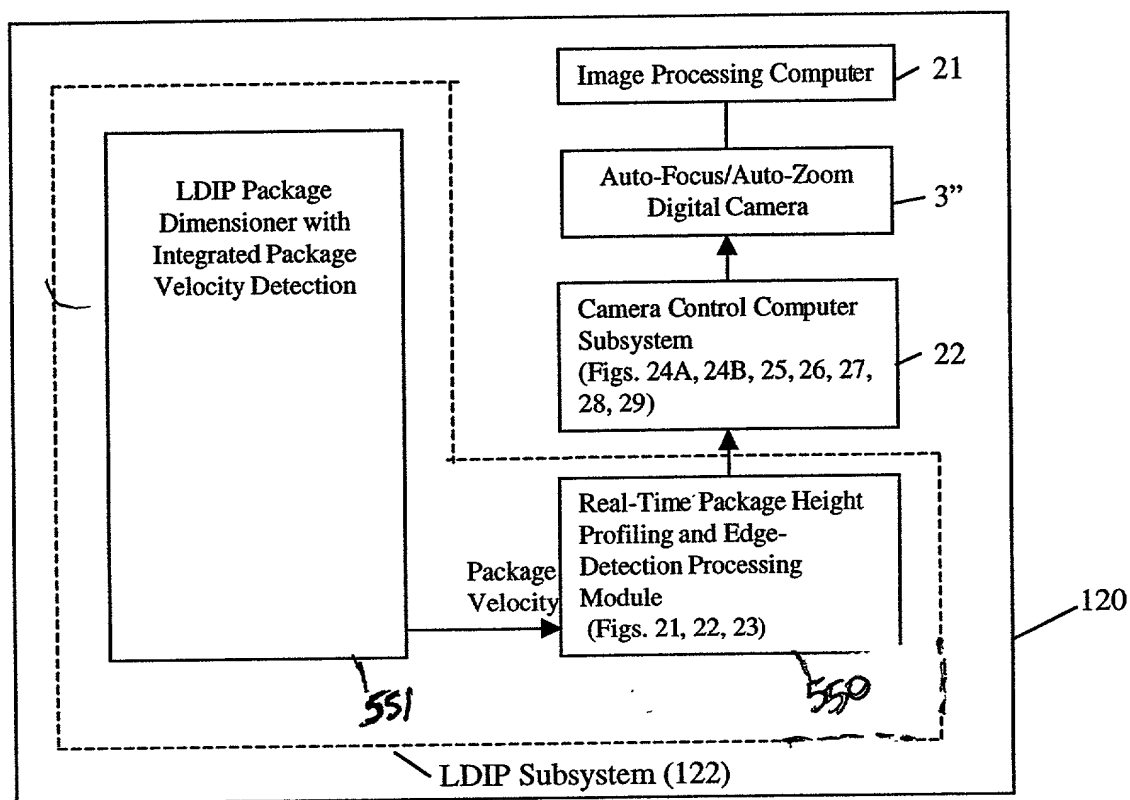


FIG. 14

# LDIP REAL-TIME PACKAGE HEIGHT PROFILE AND EDGE DETECTION METHOD

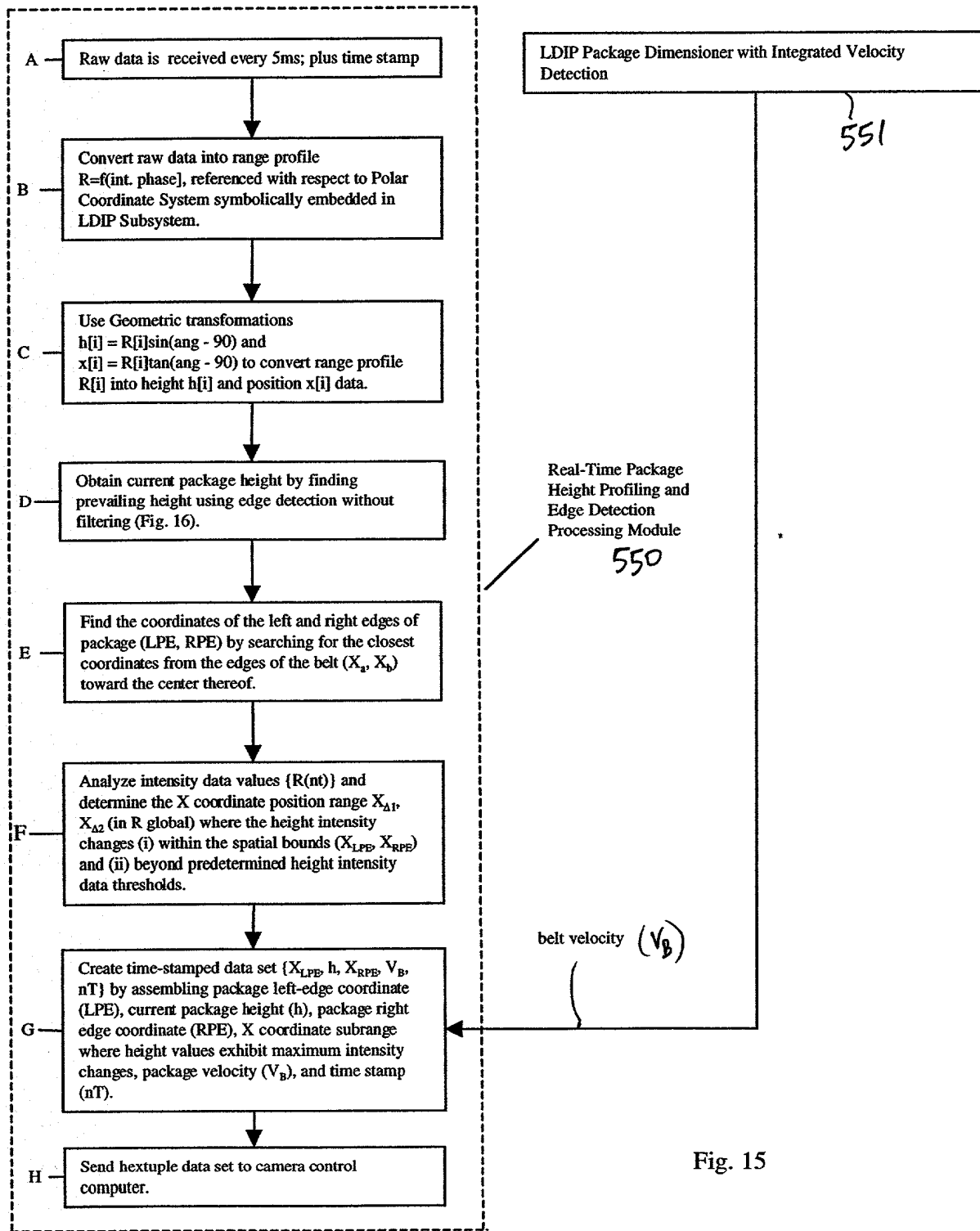
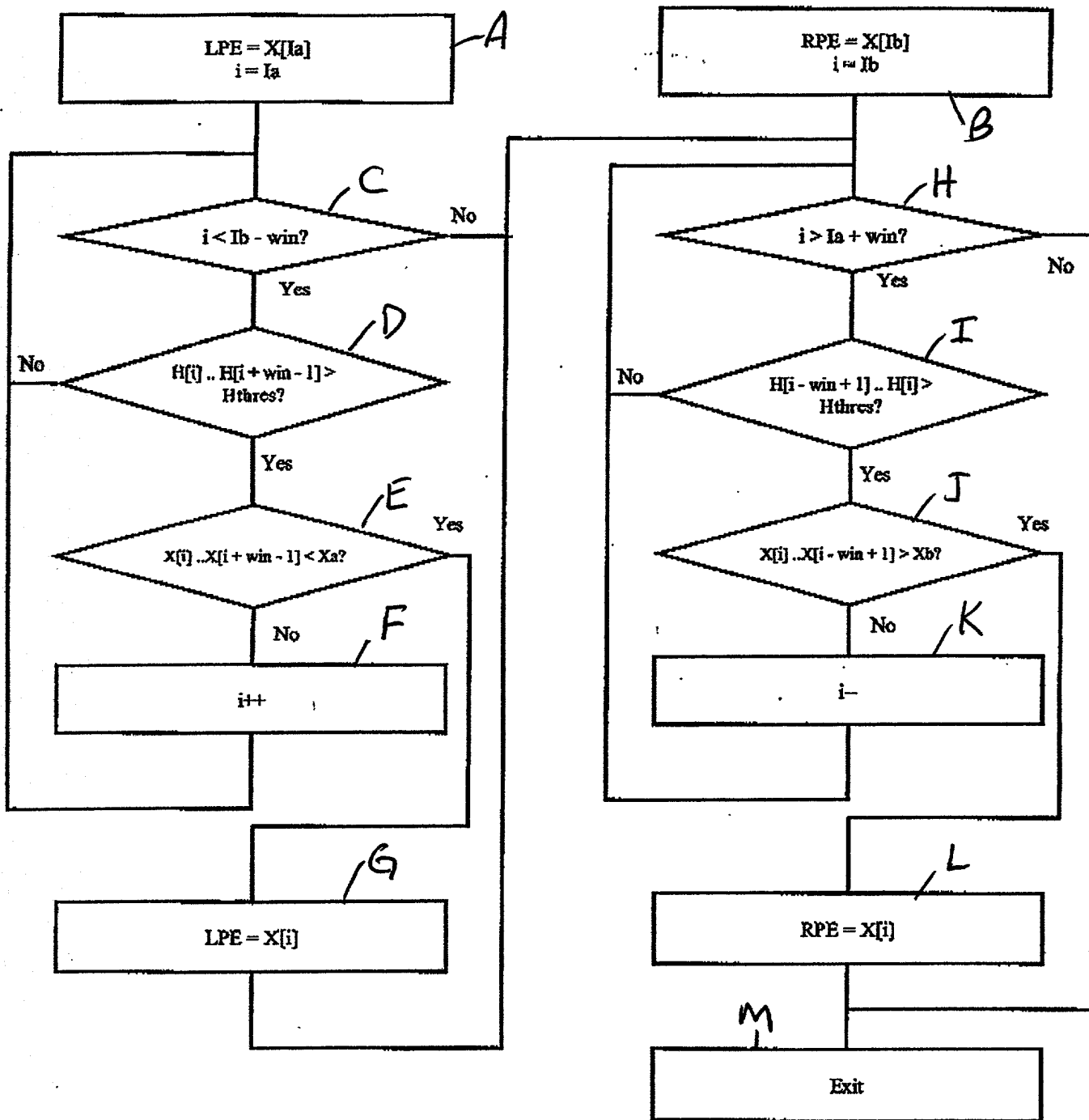


Fig. 15

212/332

# LDIP Real Time Package Edge Detection



Xa = location of belt left edge; Xb = location of belt right edge  
 Ia = belt edge edge pixel; Ib = belt right edge pixel  
 LPE = Left package edge; RPE = Right package edge  
 H[] = Pixel height array; X[] = Pixel location array  
 win = package detection window

FIG. 16

213/332

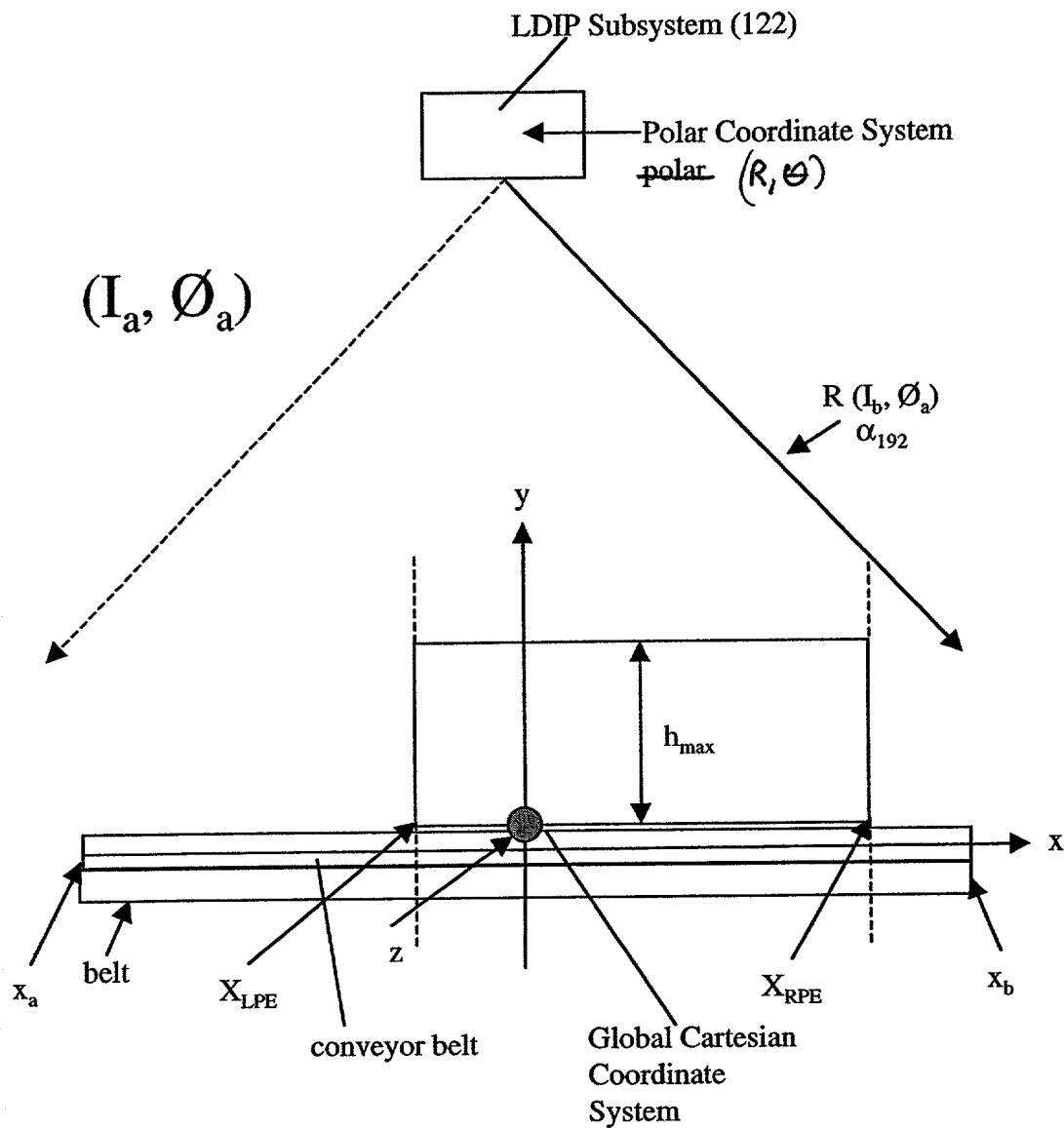


Fig. 17



# INFORMATION MEASURED AT SCAN ANGLES BEFORE COORDINATE TRANSFORMS

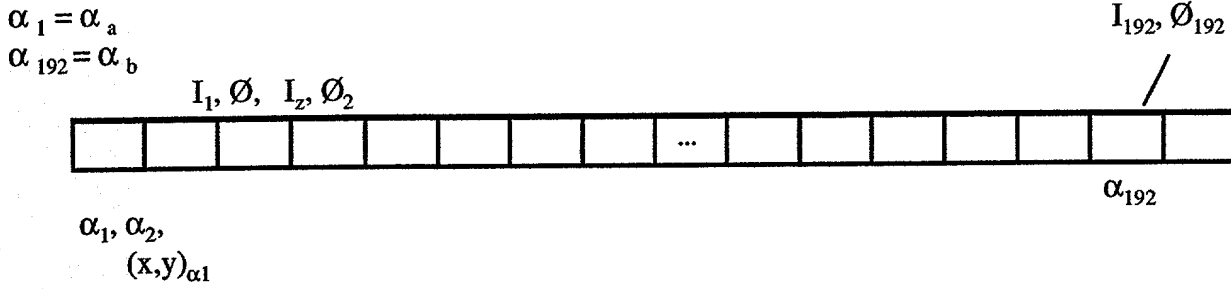


Fig. 17A

## RANGE AND POLAR ANGLE MEASURES TAKEN AT SCAN ANGLE $\alpha$ BEFORE COORDINATE TRANSFORMS



Fig. 17B

## MEASURED PACKAGE HEIGHT AND POSITION VALUES AFTER COORDINATE TRANSFORMS

$H[ ]$   
Input height after  
coordinate transforms

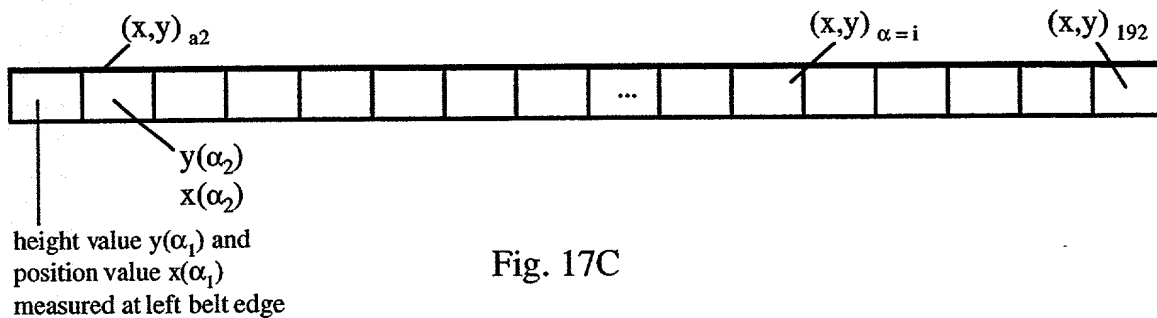


Fig. 17C

215/332.

# CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA CONTROL SUBSYSTEM OF EACH OBJECT ATTRIBUTE ACQUISITION AND ANALYSIS SYSTEM

560

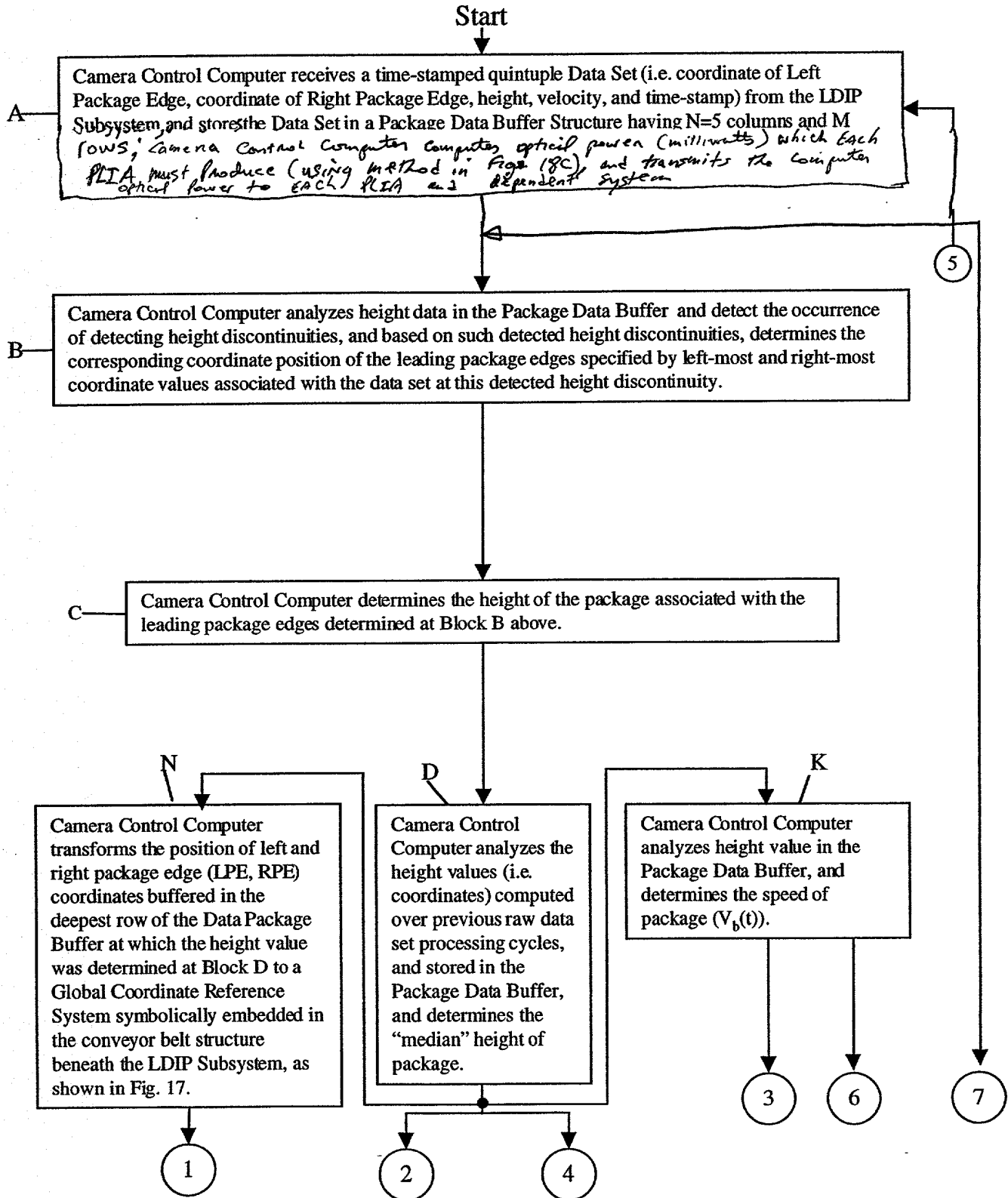


Fig. 18A

216/332.

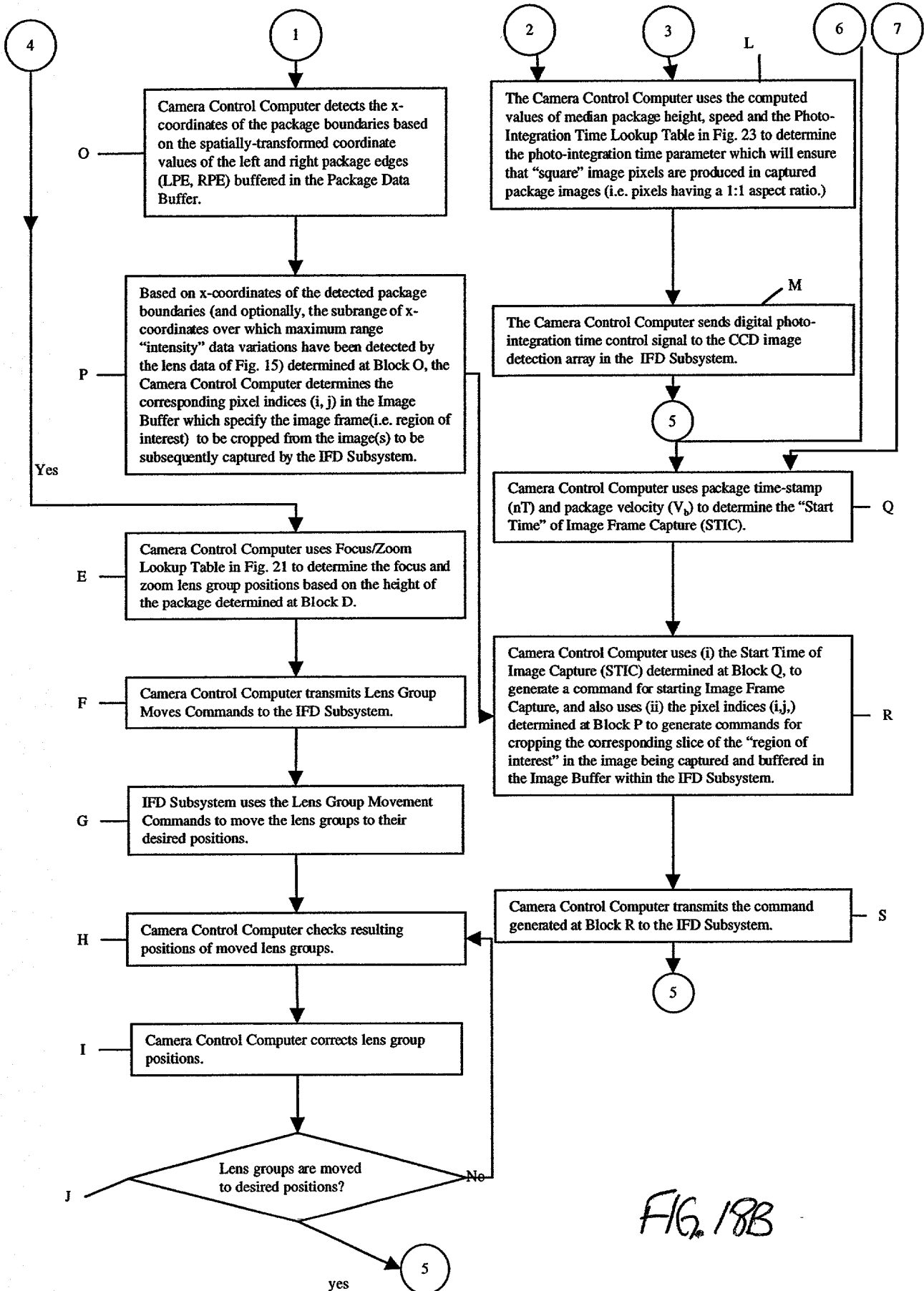


FIG. 18B

217/332

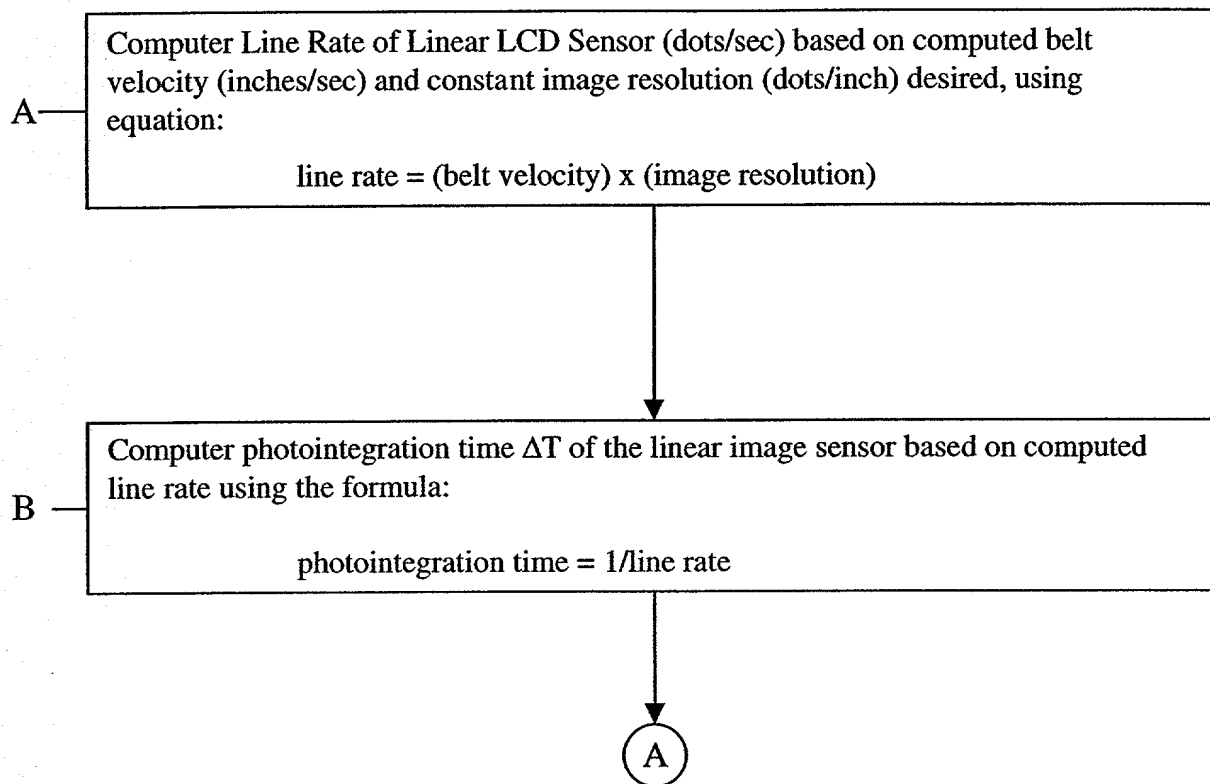


Fig. 18C1



Compute optical power (milliwatts) of each PLIA based on computed photointegration time ( $\Delta T$ ) using the following formula:

$$\text{optical power of LD (milliwatts)} = \frac{\text{constant}}{\text{photointegration time } \Delta T}$$

Fig. 18C2

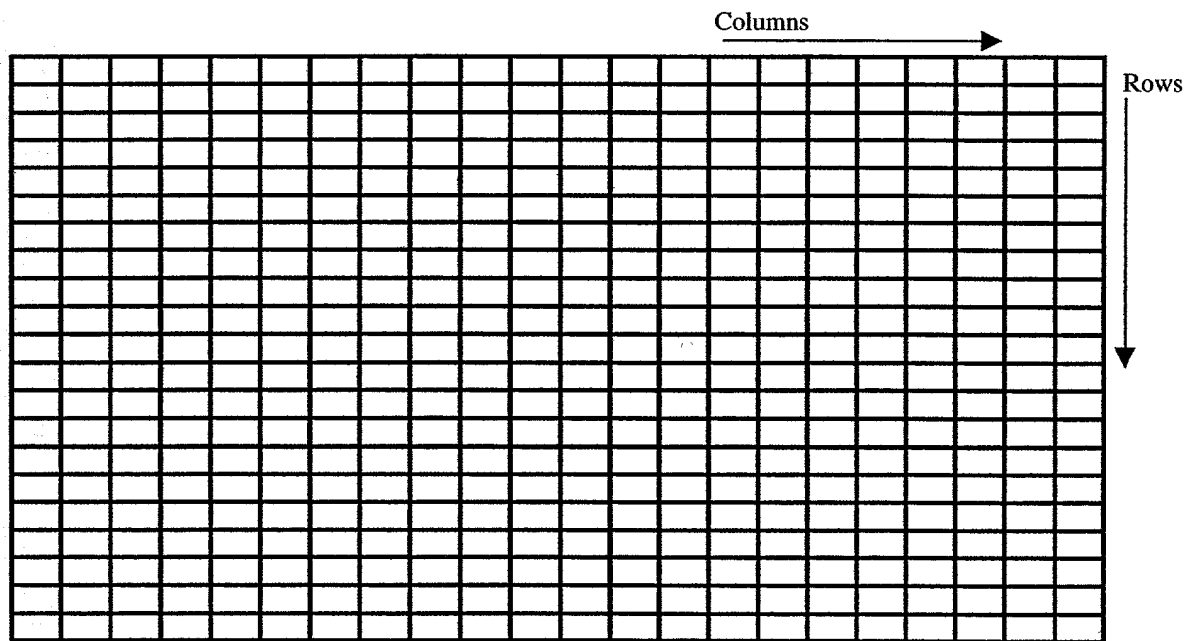
219/332

X coordinate subrange where  
maximum range "intensity"  
variations have been detected

Left Package Edge (LDE)	Package Height (h)	Right Package Edge (RPE)	Package Velocity	Time-stamp (nT)	
					Row 1
					Row 2
					Row 3
					Row 4
					Row 5
					Row M

Package Data Buffer (FIFO)

Fig. 19



Camera Pixel Data Buffer  
pixel indices (i,j)

Fig. 20

220/332

Look-48 TAB6

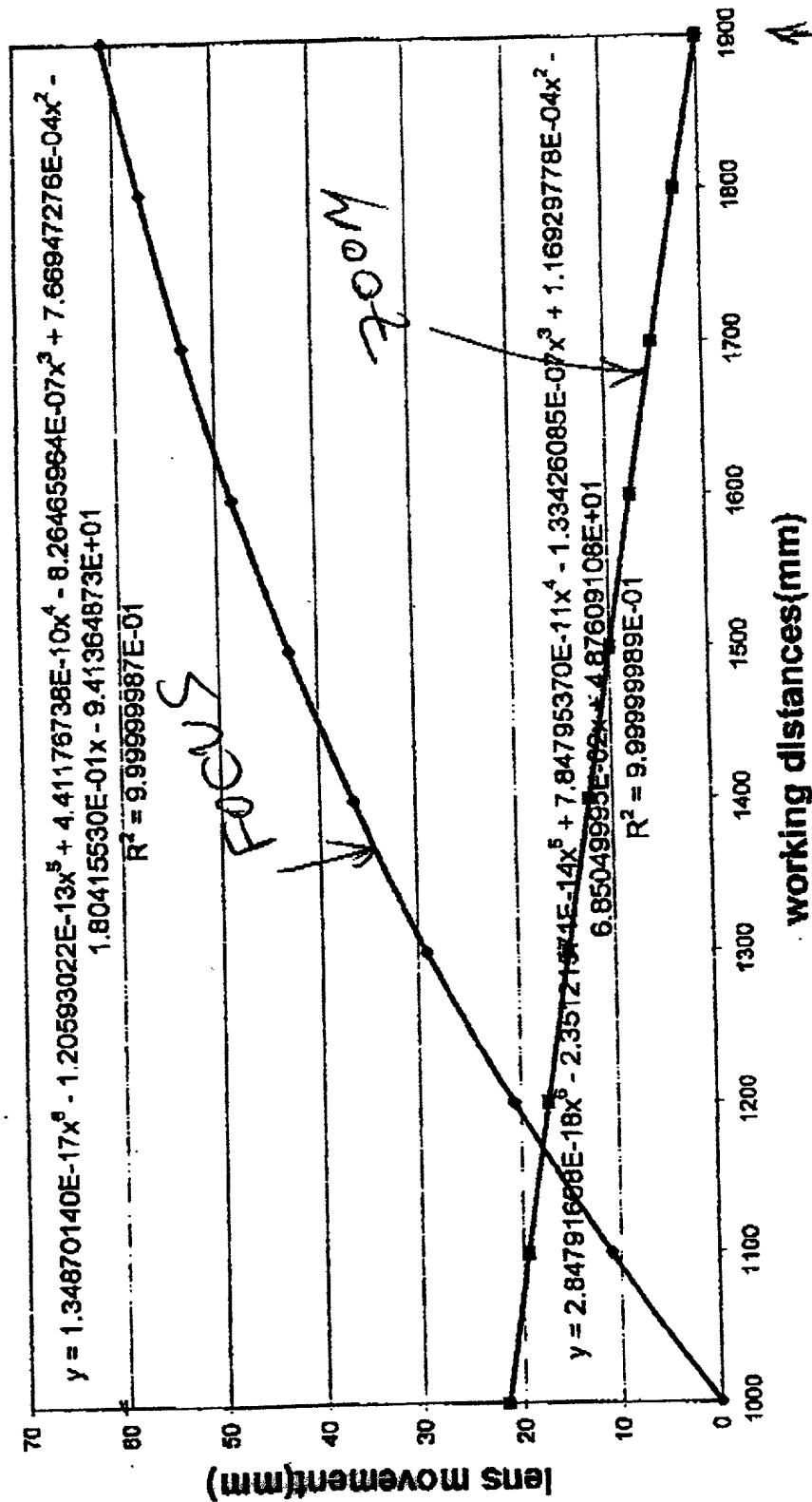
FIG. 21

FIG. 21

209020' E0889900T

\* Note: The focal distance & zoom (eff. focal length) of camera lens are coupled (inter-dependent) in this camera has a fixed aperture F5.6

# Focus and Zoom lens movement vs. working distances



Legend: zoom 1 (diamond) zoom 2 (square) Poly. (zoom 1) Poly. (zoom 2)

(inches) 36 above conveyor belt

← package height above conveyor

conveyor-belt surface

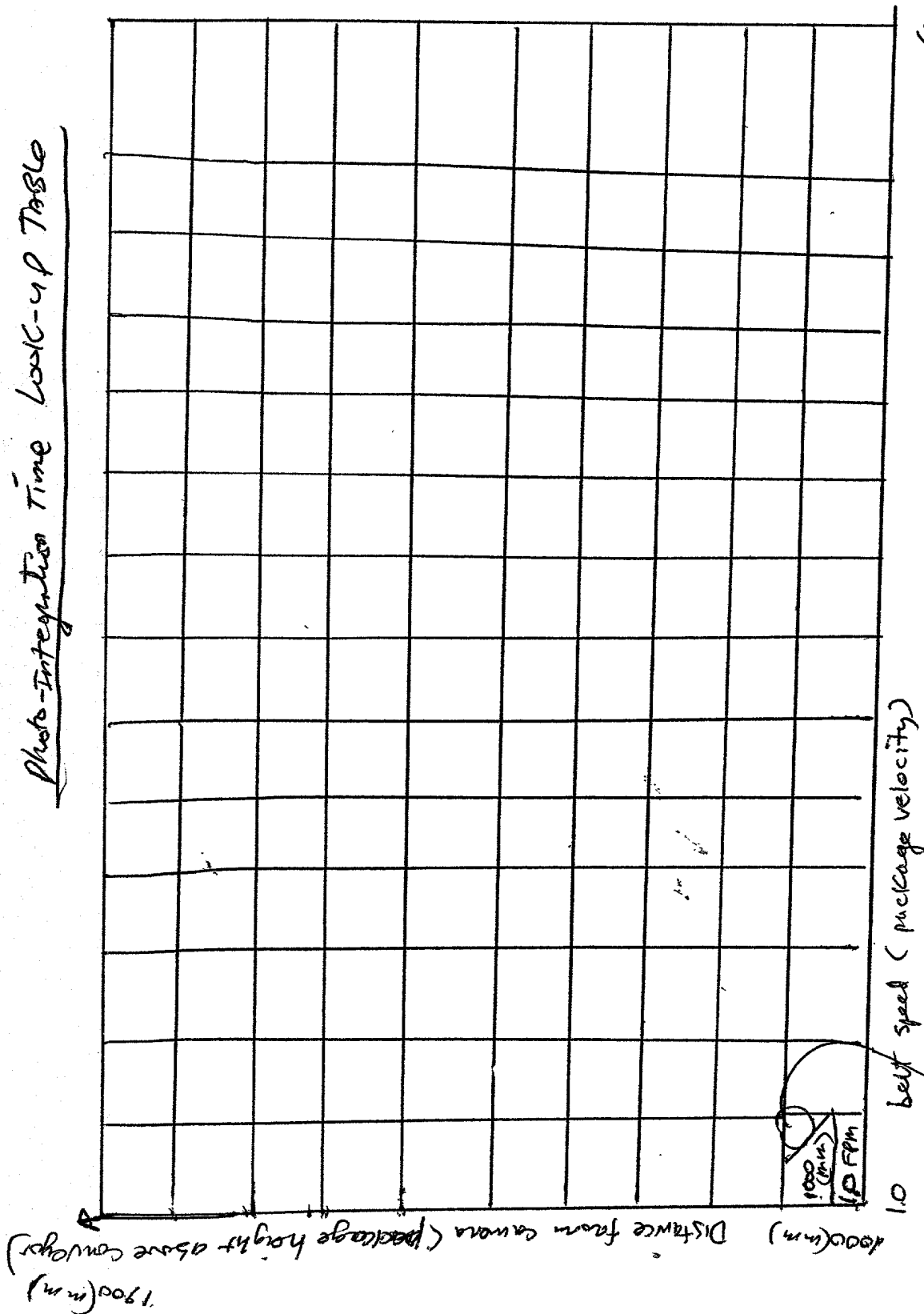
FIG. 22



209020-008900T

222/332

# Photo-Integration Time Look-up Table



600 feet per minute  
(FPM)

FIG. 23

Photo-Integration  
Time value that  
ensures square image pixels  
(1:1 aspect ratio)

200020" 008900T

223/332

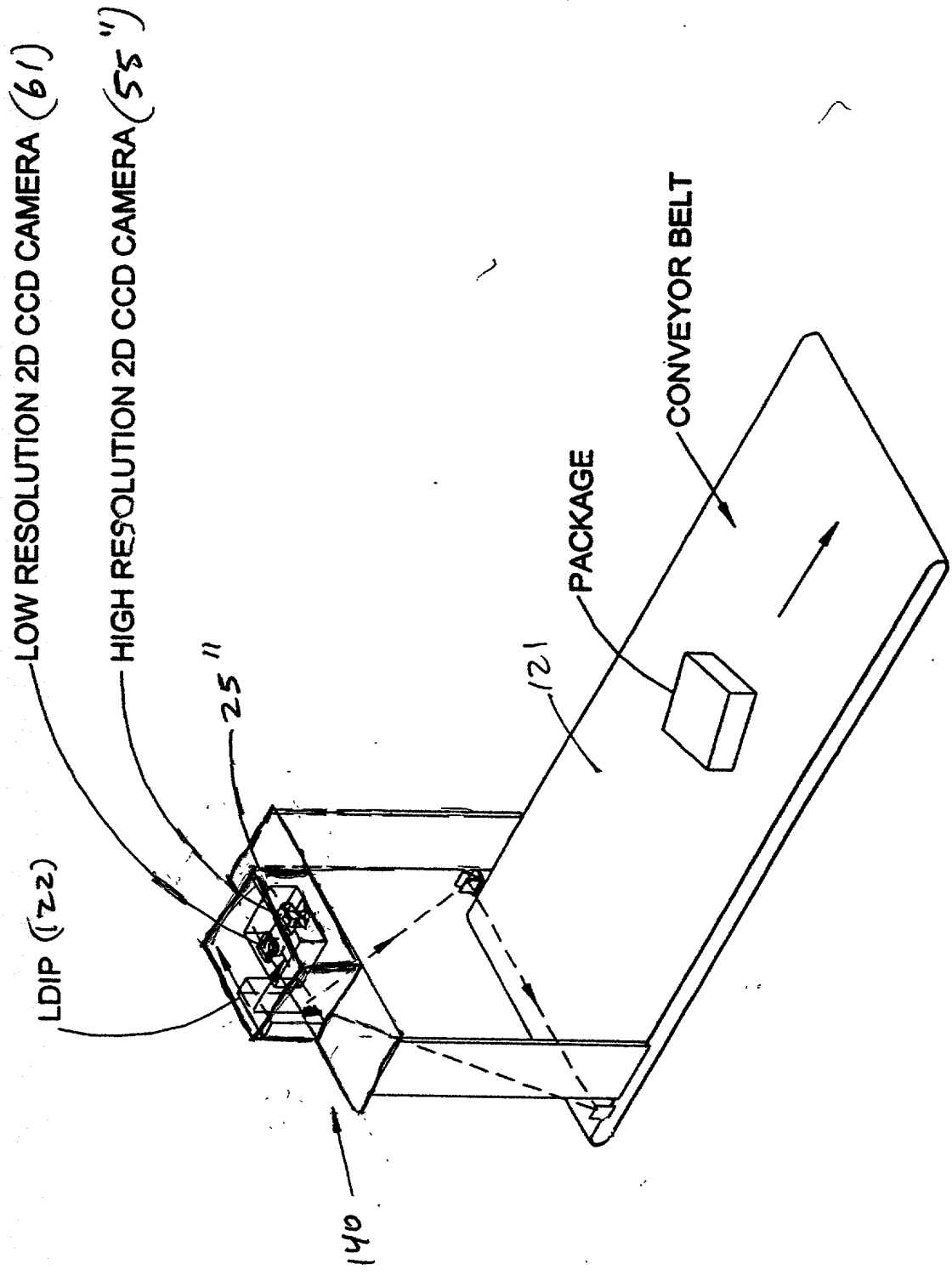


FIG 24

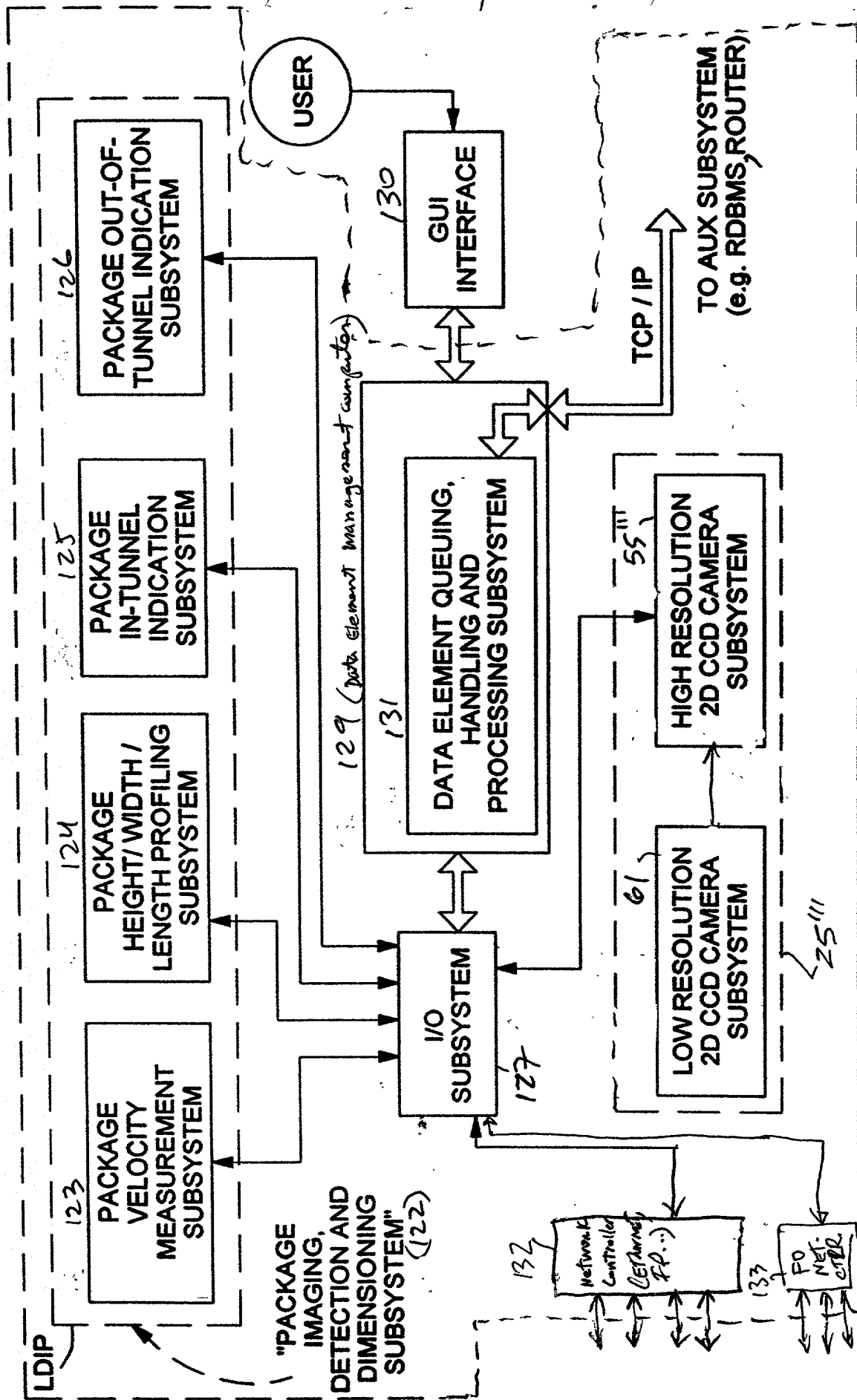


FIG. 25

140

225/332

20250101 000000

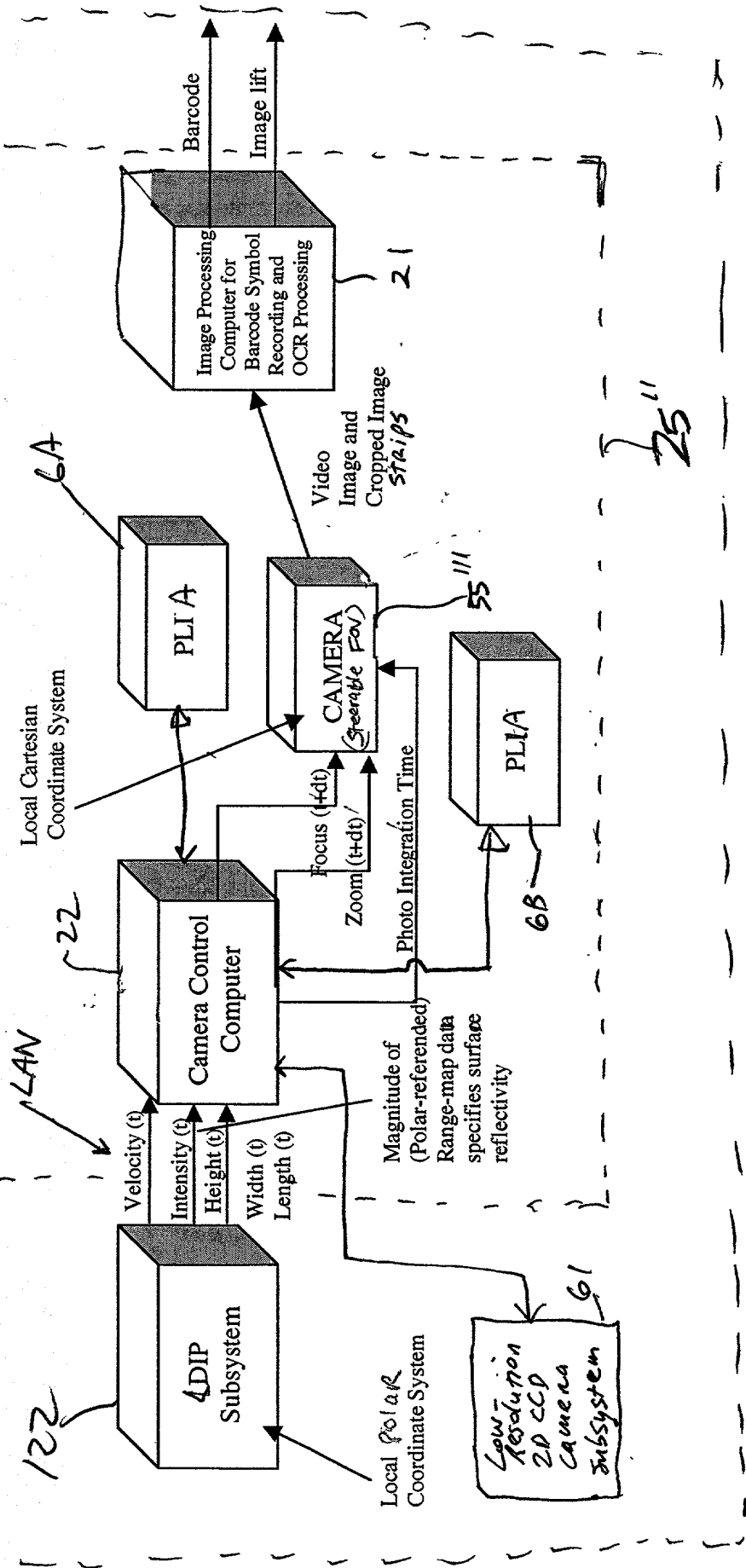
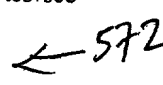
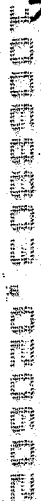


FIG. 26

140



227/332

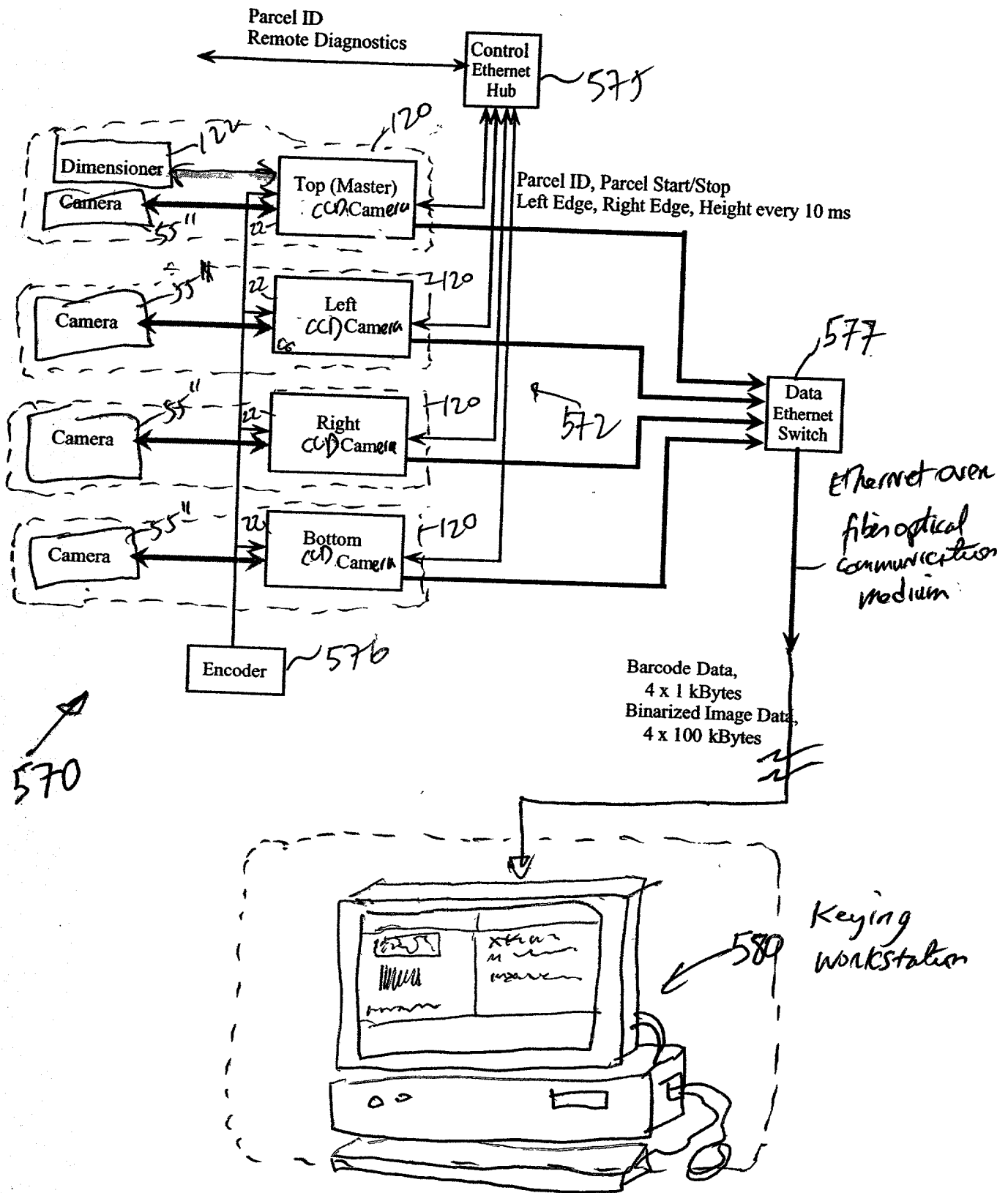
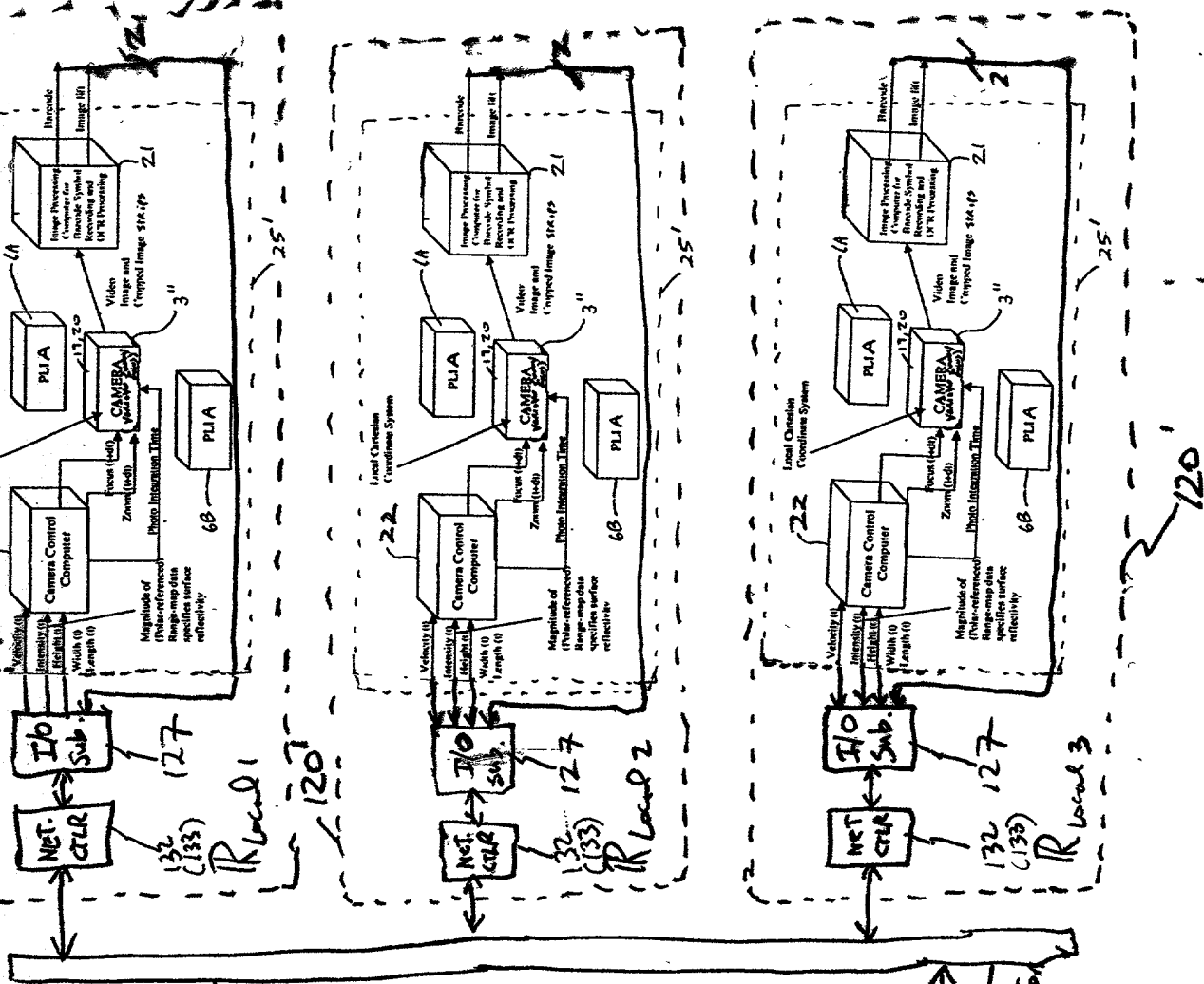


FIG. 29

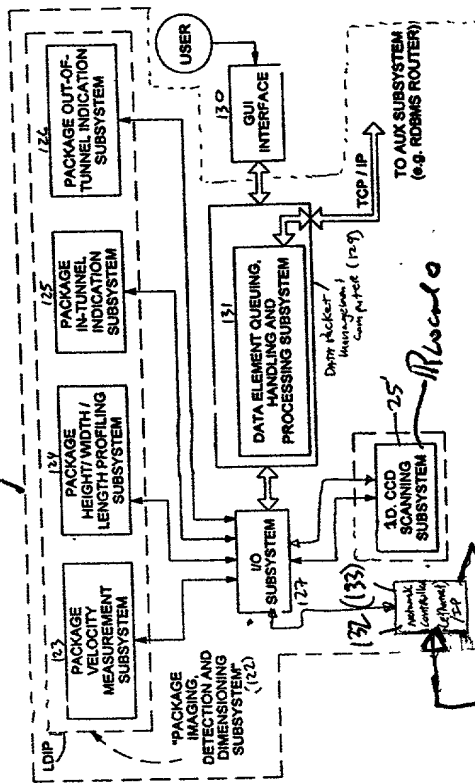
200000-500000



570

572

120



Coordinate Data Referenced with respect to  $R_{global}$

Velocity(t)  
Intensity(t)  
Height(t)  
Width(t)  
Length(t)

Network Communication Medium

FIG 30

CCD Camera-Based Tunnel System  
Employing Package Coordinate Data  
Driven Method of Automatic Camera  
Zoom and Focus Control

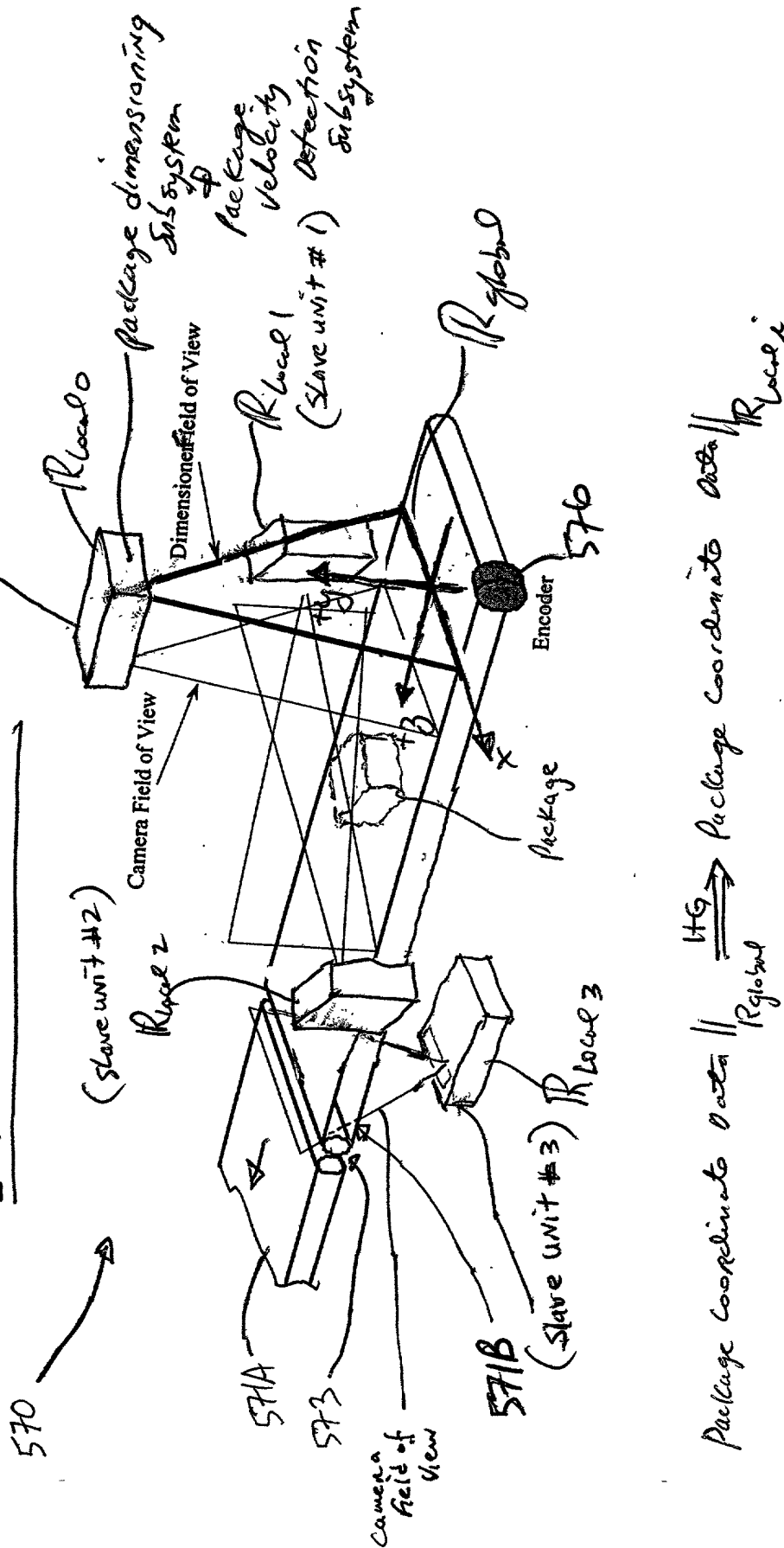


FIG. 31



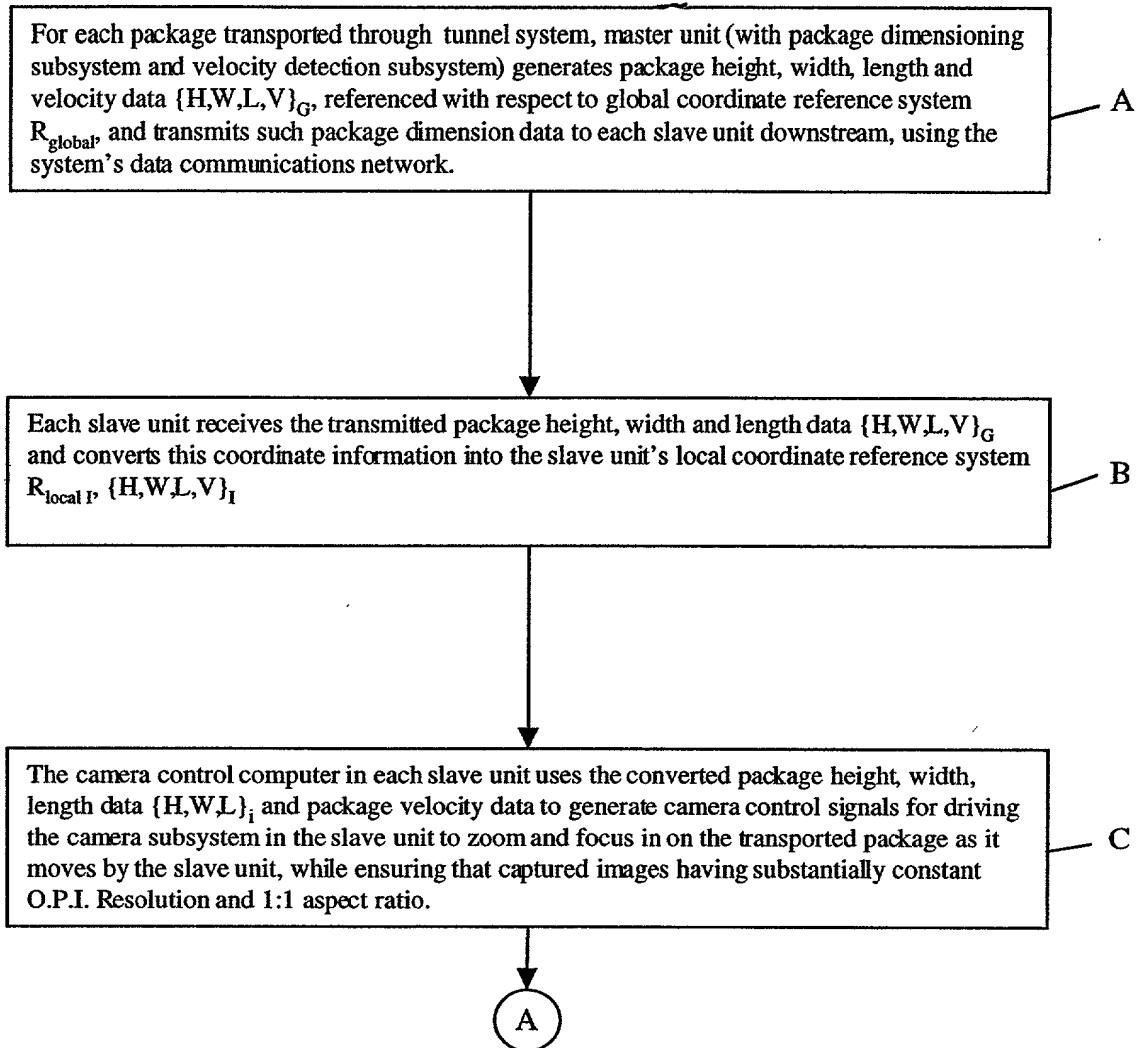


FIG. 32A



Each slave unit captures images acquired by its intelligently controlled camera subsystem, buffers the same, and processes the images to decode bar code symbol identifiers represented in said images, and/or to perform optical character recognition (OCR) thereupon.

D

The slave unit which decodes a bar code symbol in a processed image automatically transmits a package identification data element (containing symbol character data representative of the decoded bar code symbol) to the master unit (or other designated system control unit employing data element management functionalities) for package data element processing.

E

Master unit time-stamps received package identification data element, places said data element in a data queue, and processes package identification data elements and time-stamped package dimension data elements in said queue to link each package identification data element with one said corresponding package dimension data element.

F

FIG. 32B

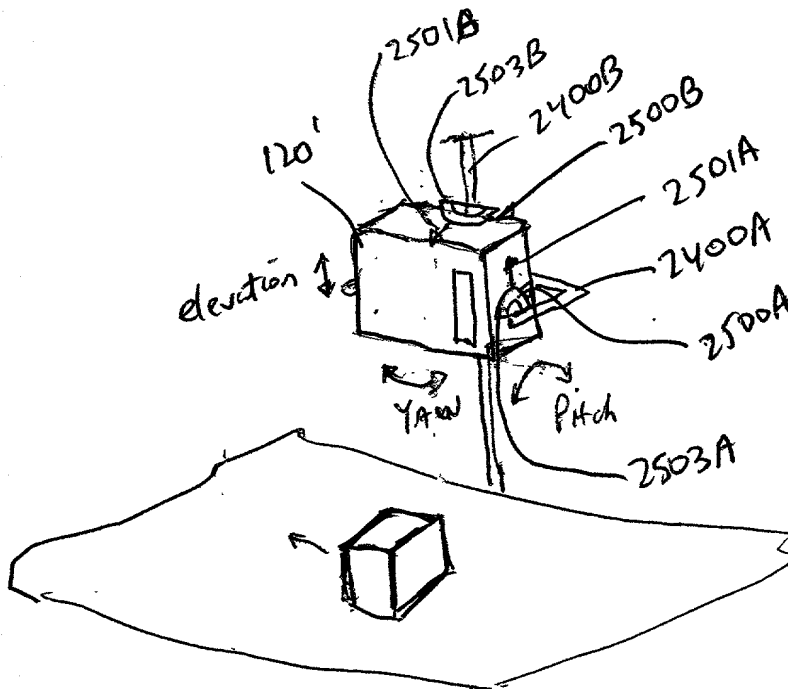
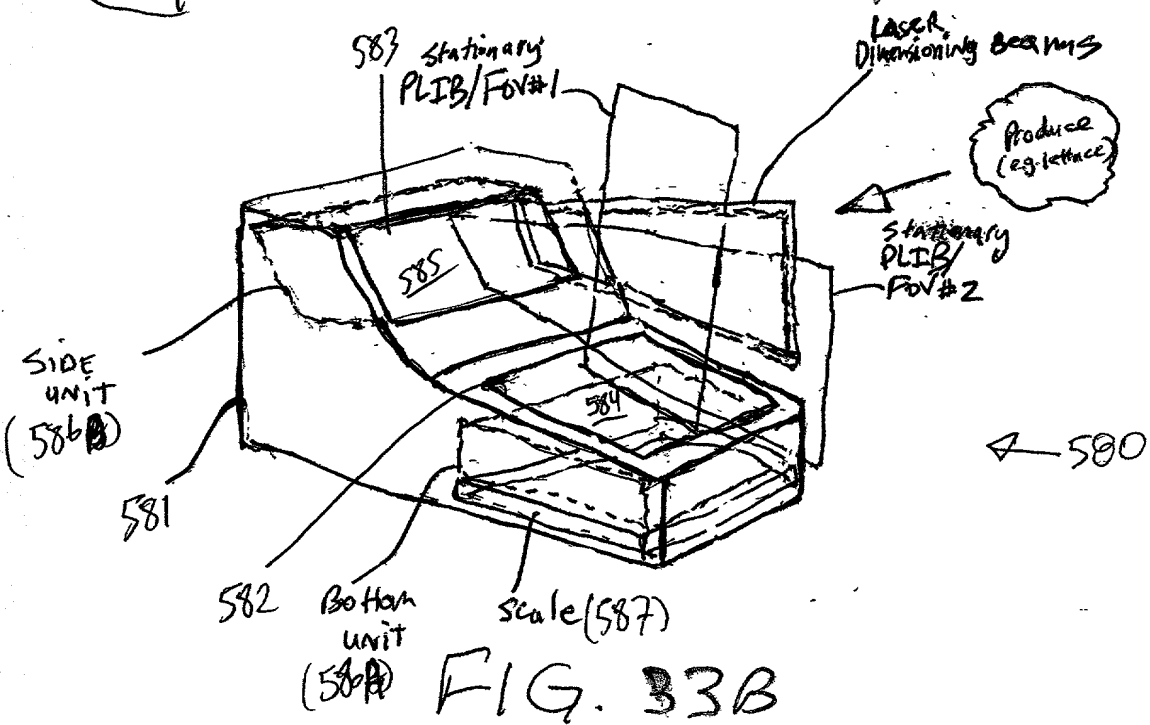
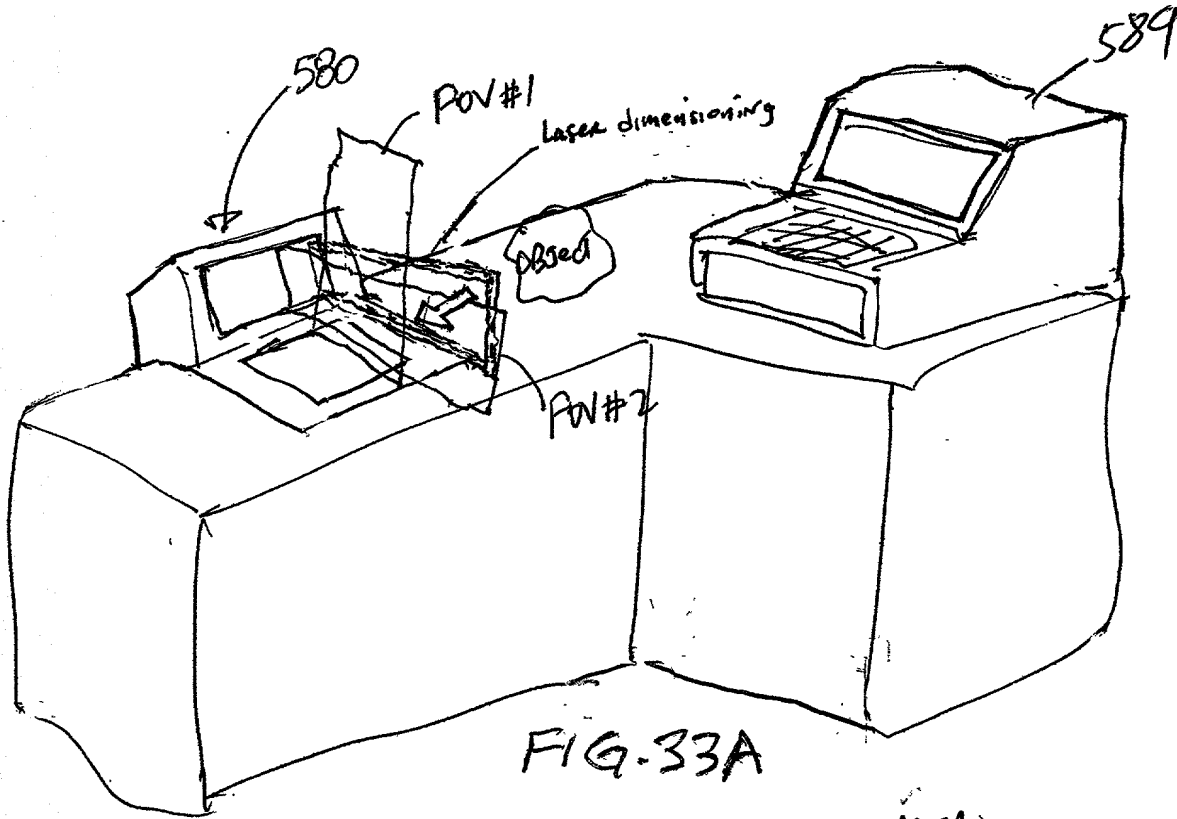


FIG. 31A

232/332



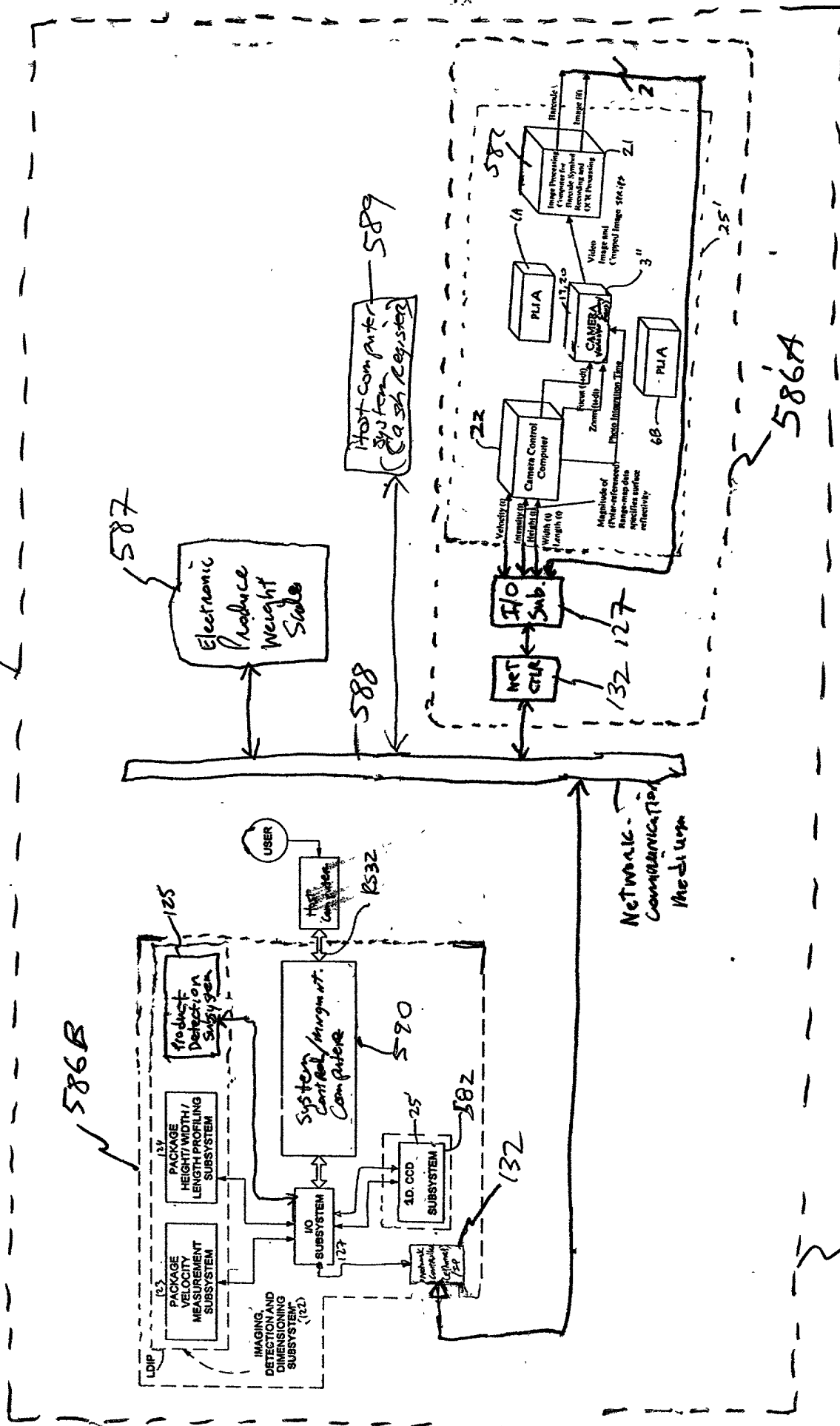


FIG. 33C

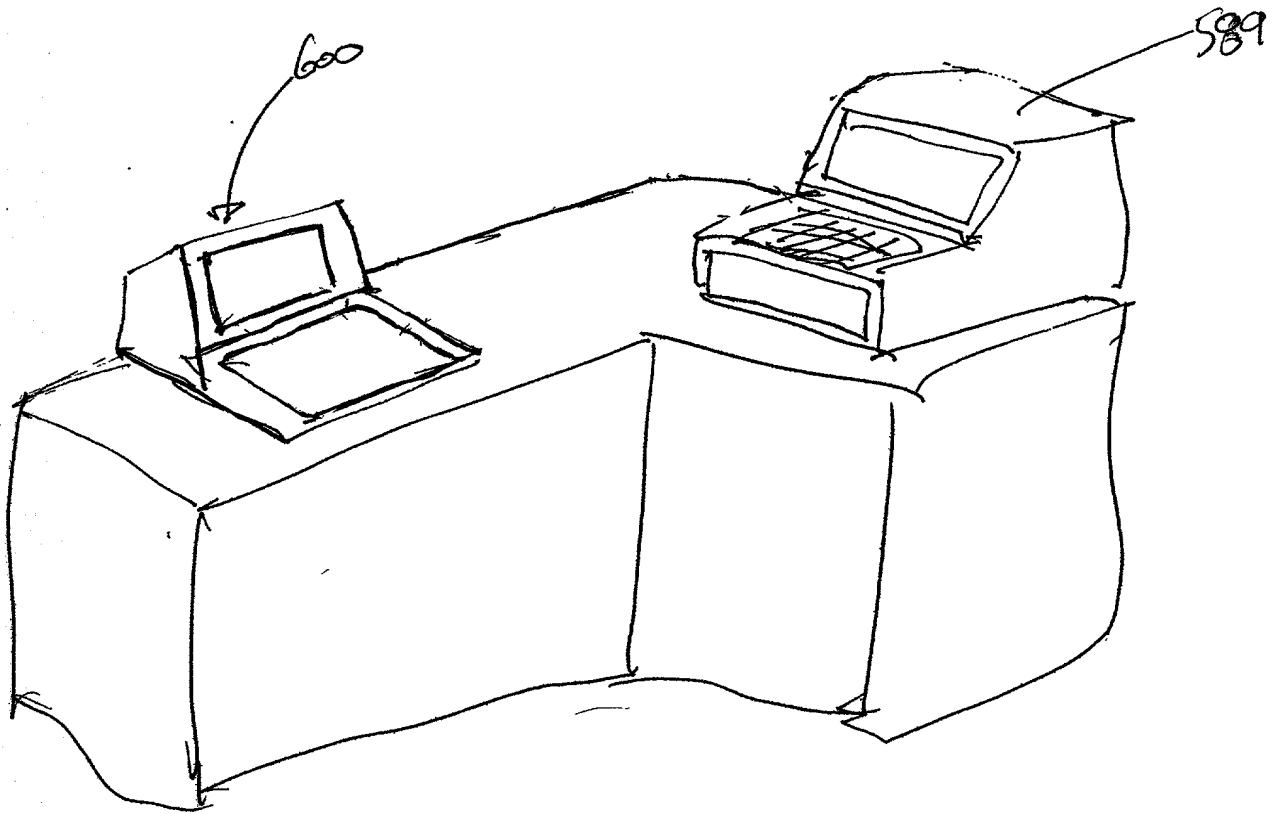


FIG. 34A

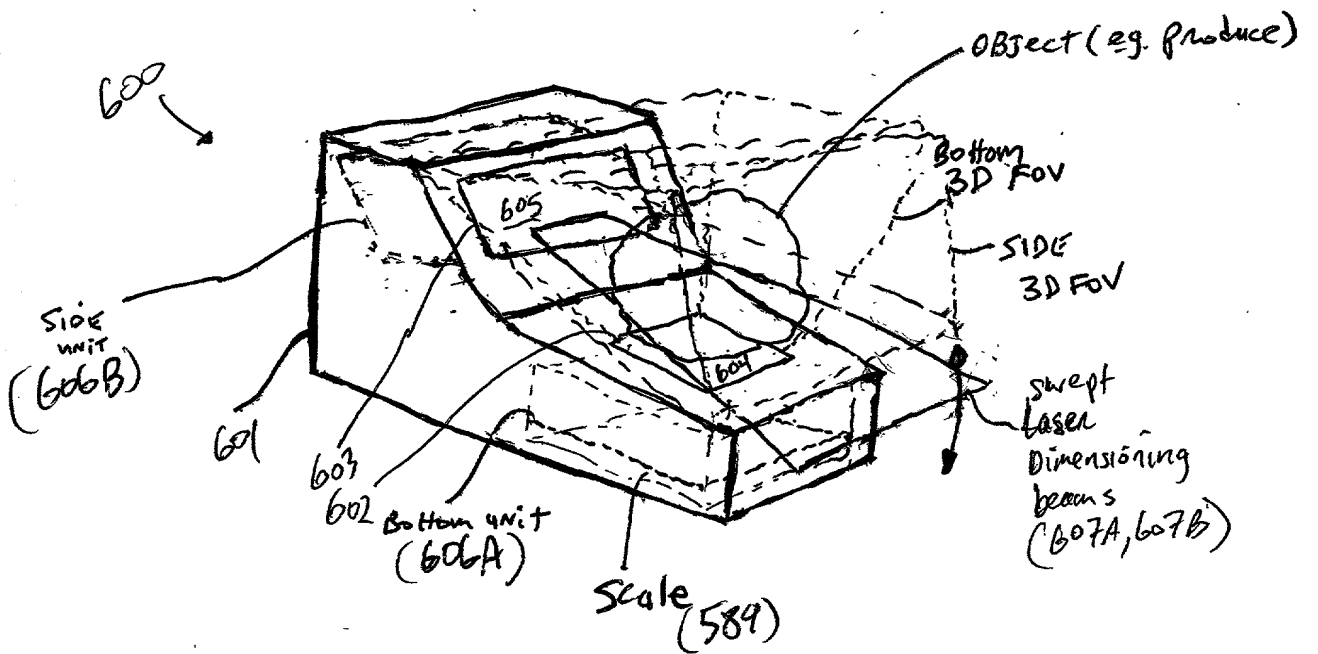
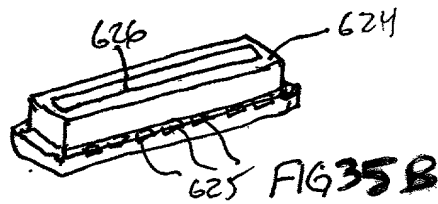
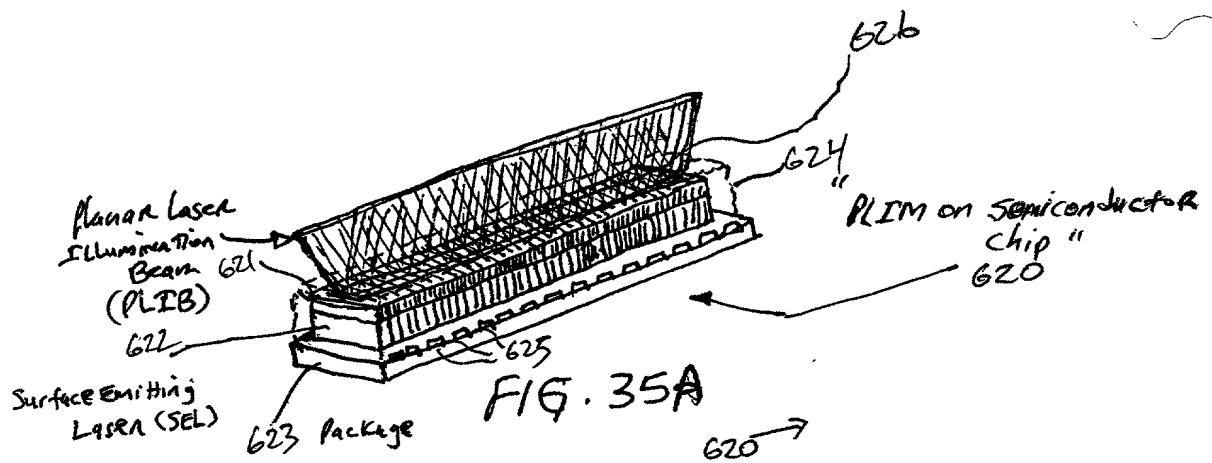
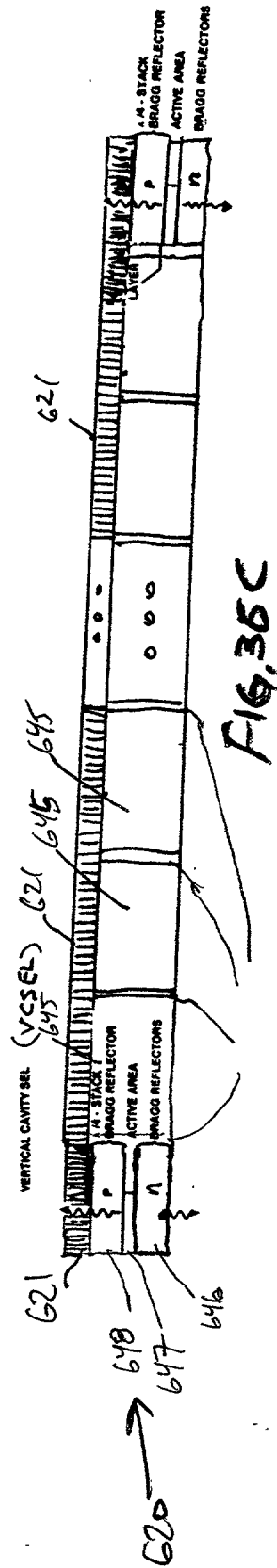
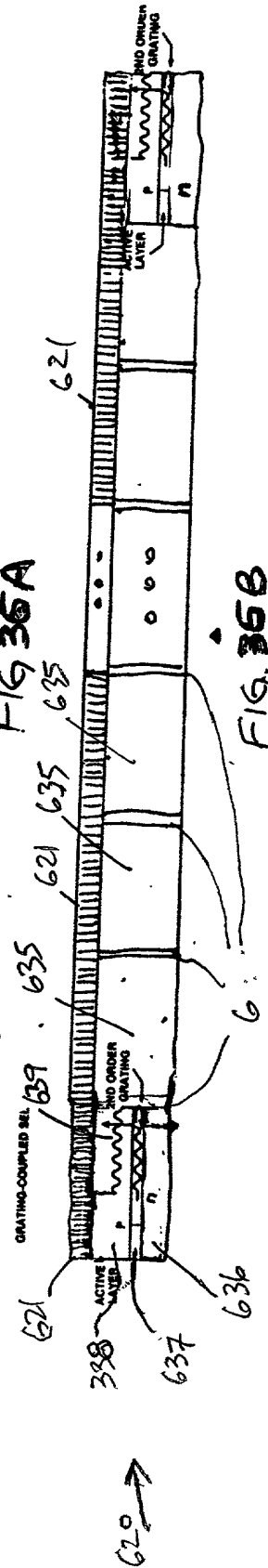
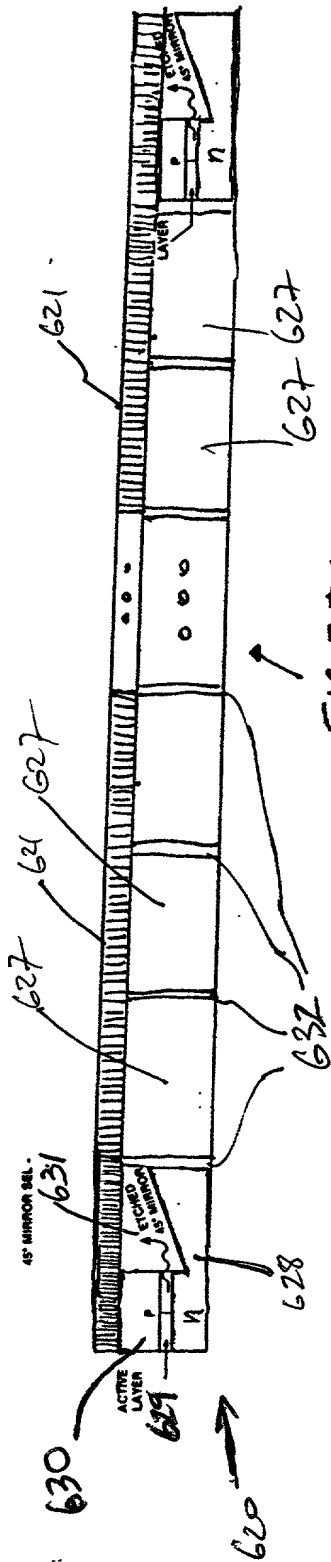


FIG. 34B



FIG. 34C







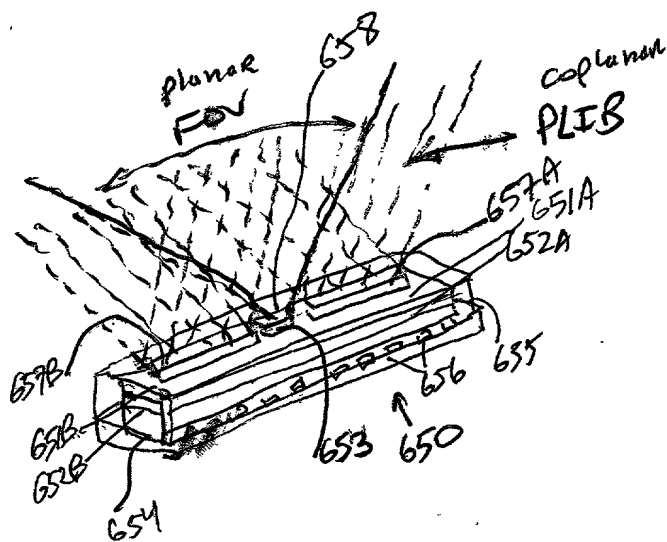


FIG. 37

239/332

360

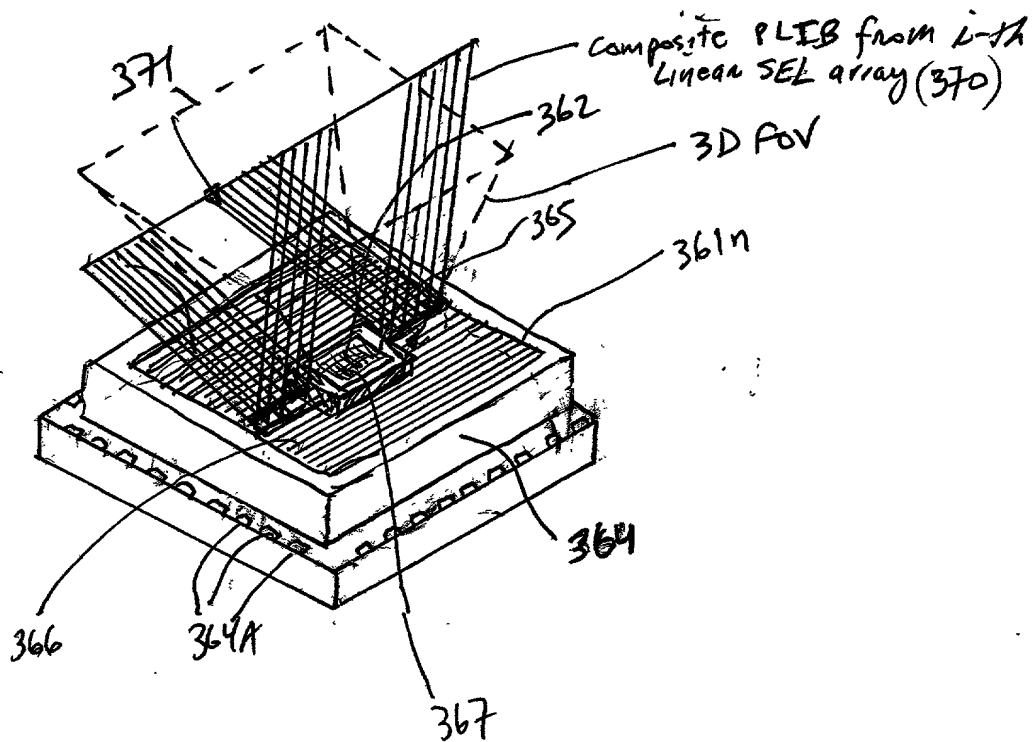


FIG. 38A

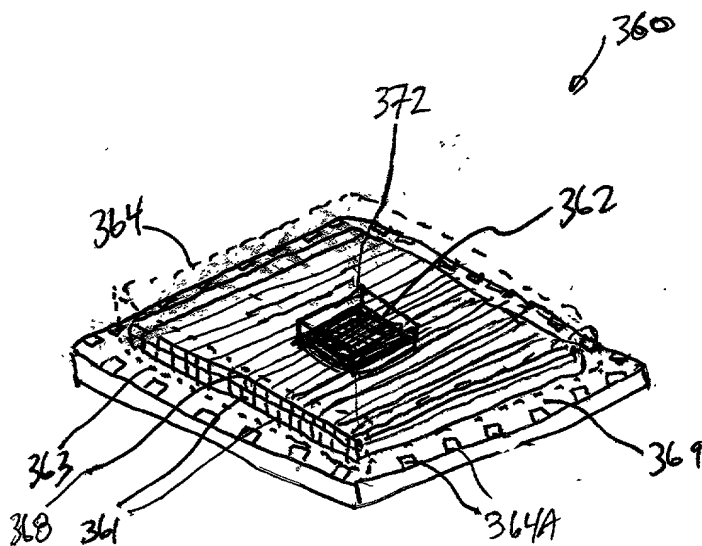


FIG. 38B

10068803 820602



241/332

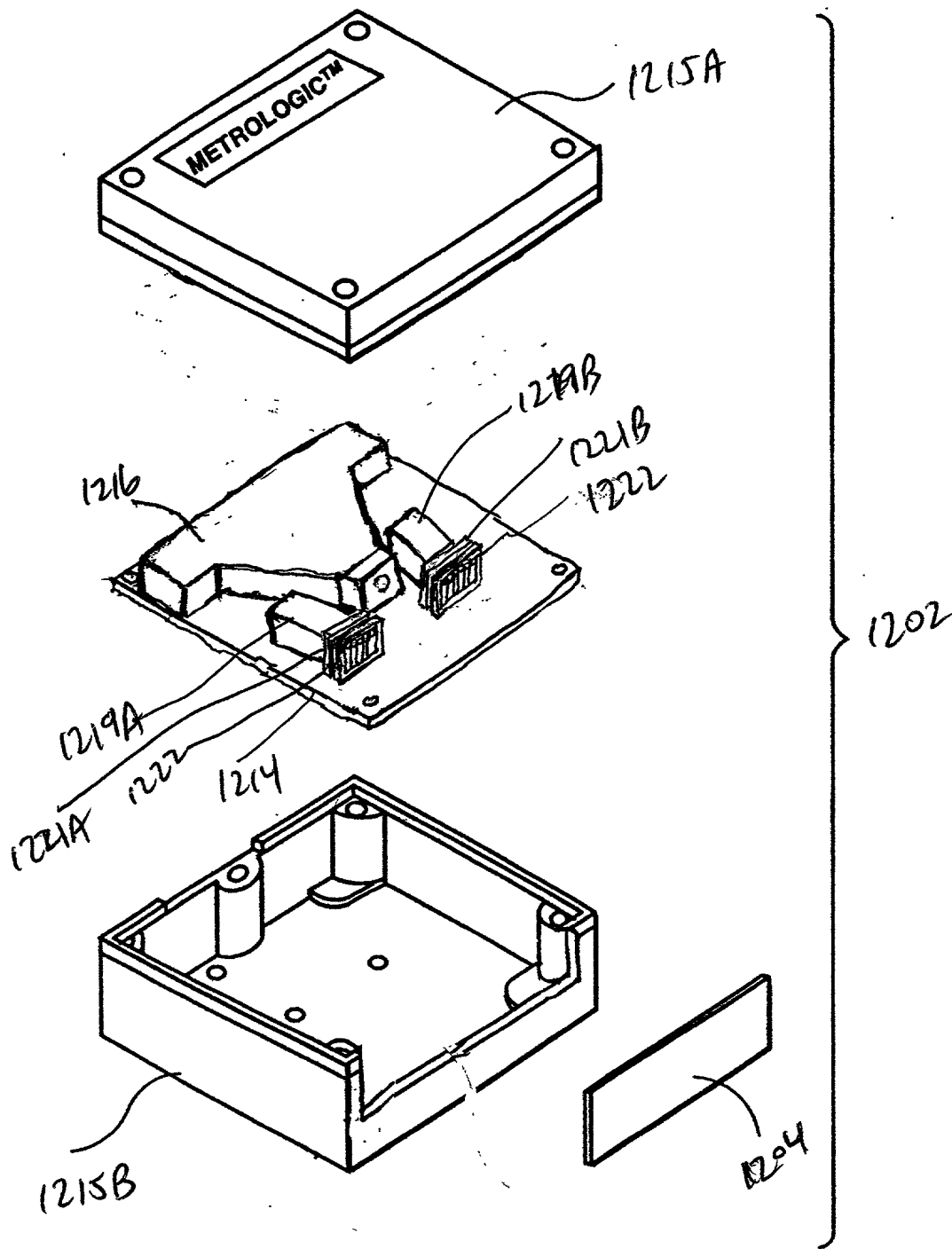


FIG. 39B

10068803.020602

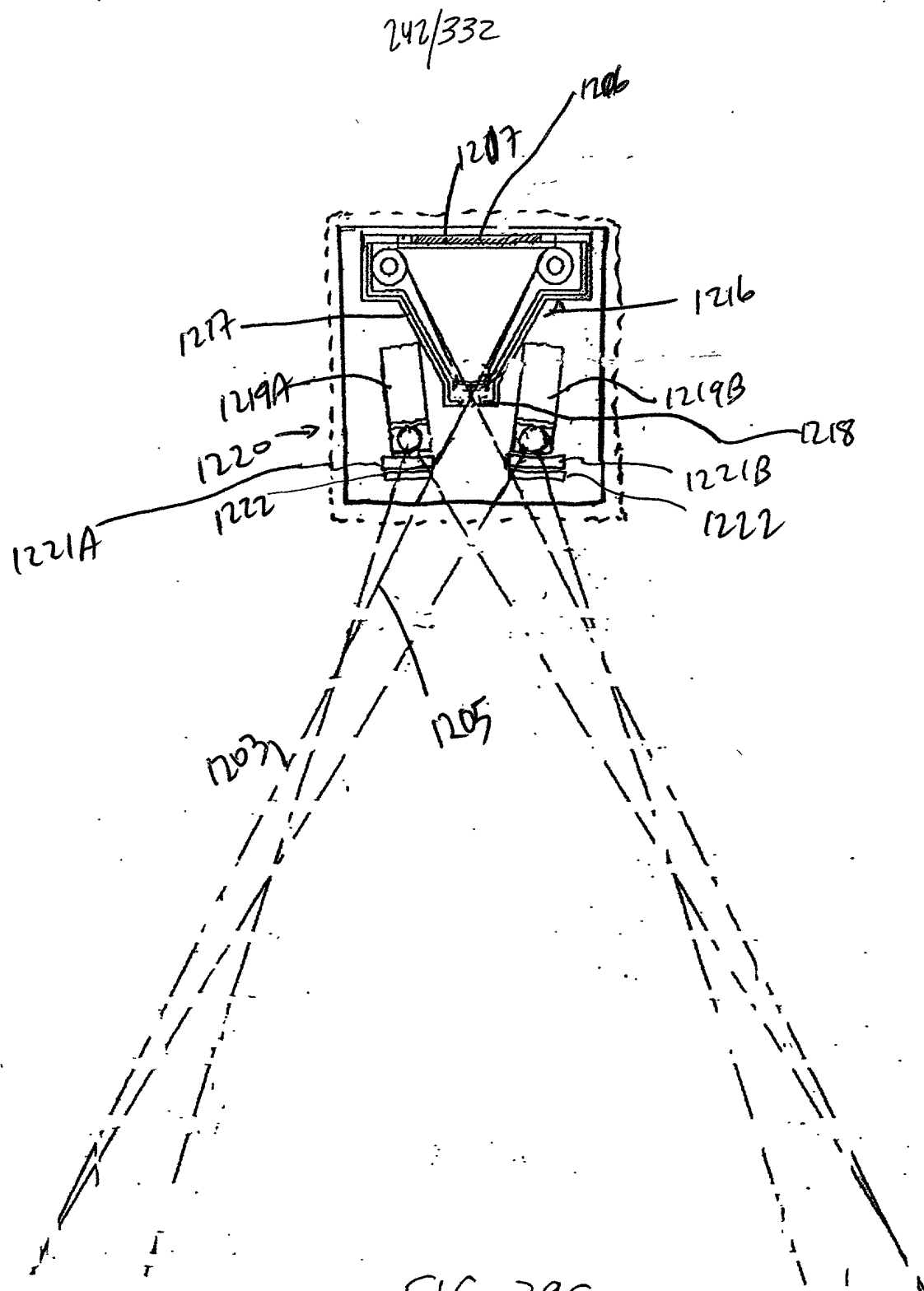
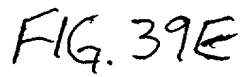
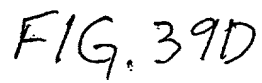
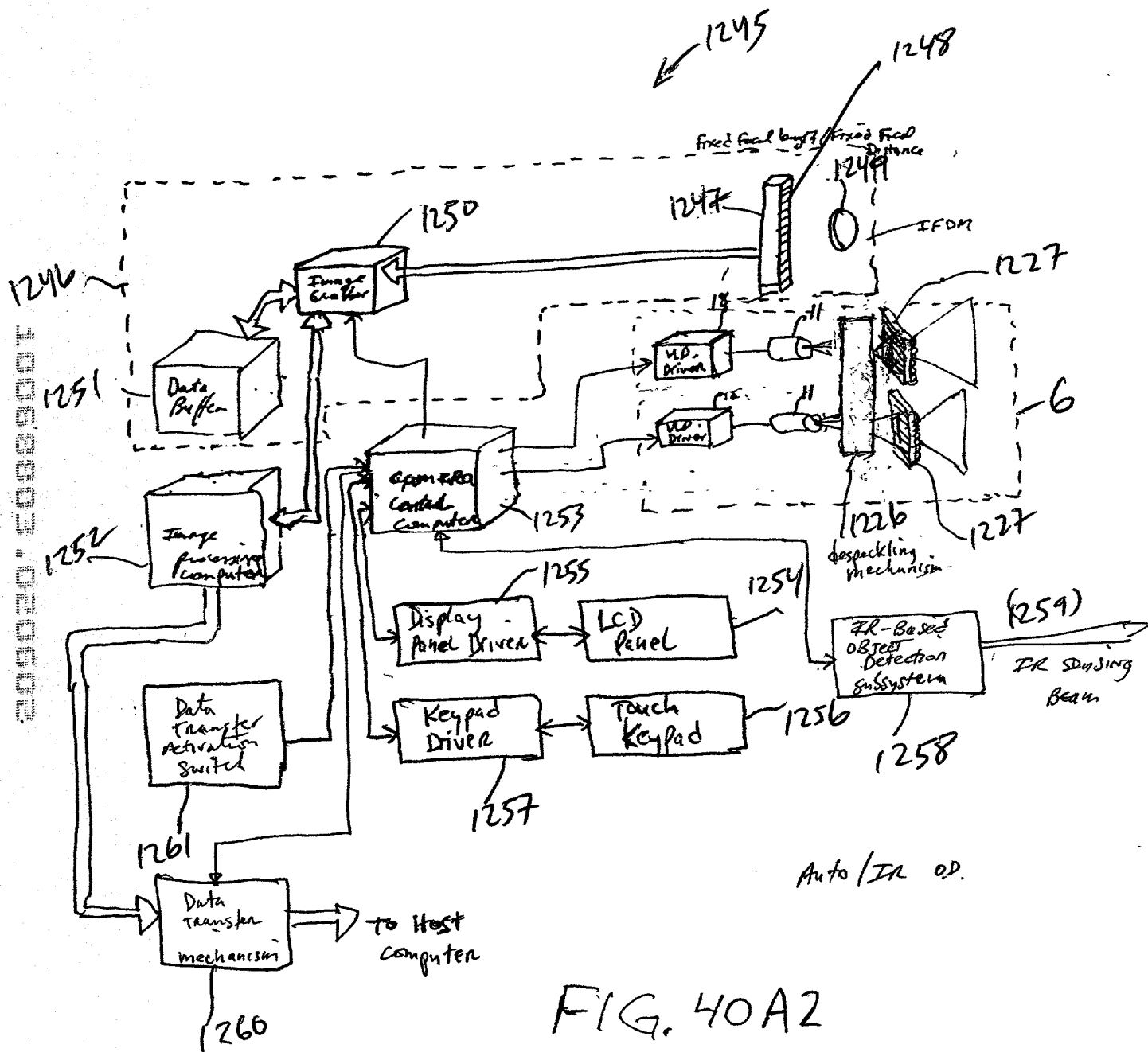


FIG. 39C

[illegible]

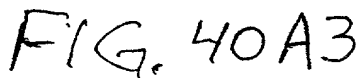


245/332





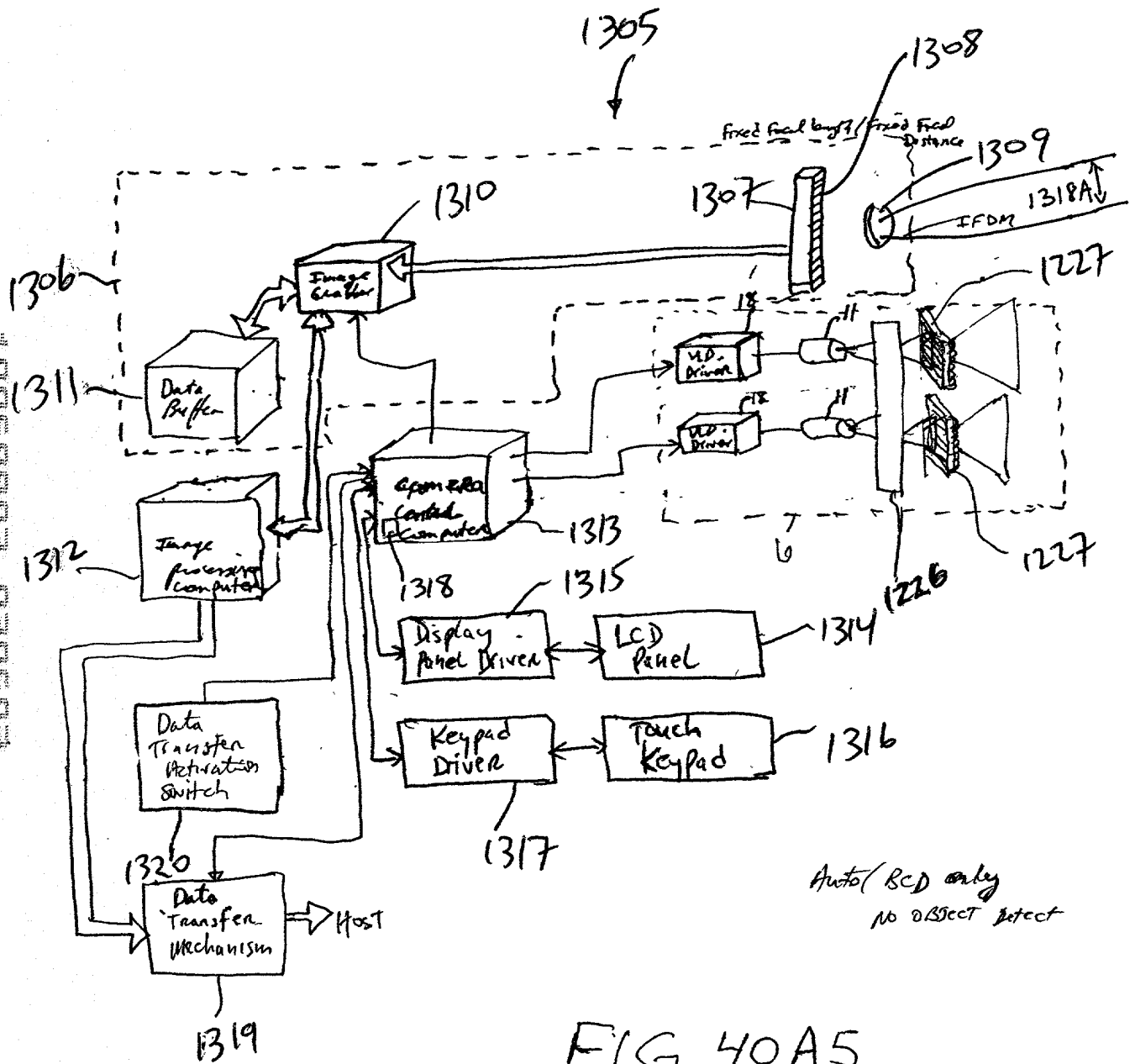
**SECRET**



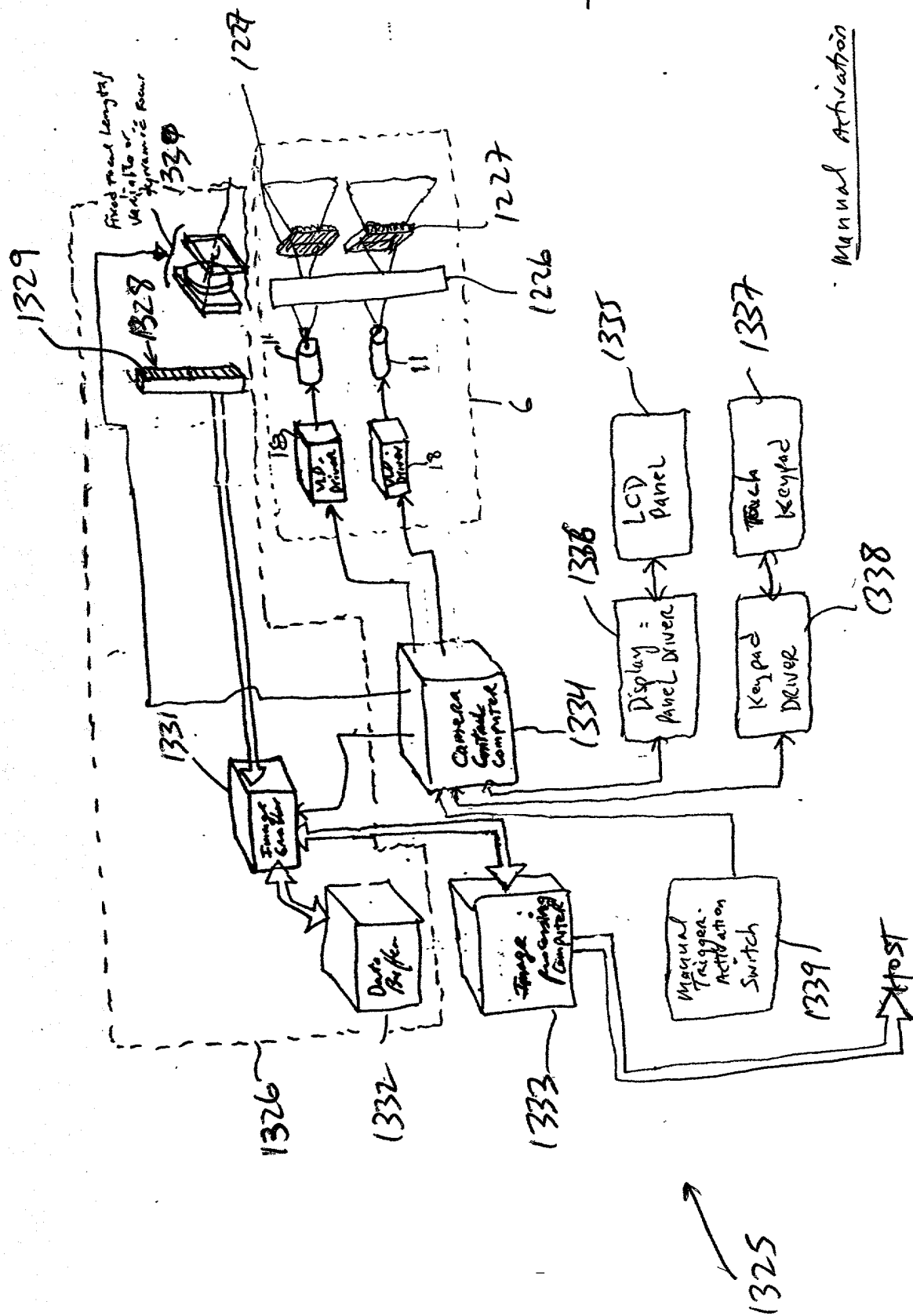


248/332.

20090901 030600



249/332





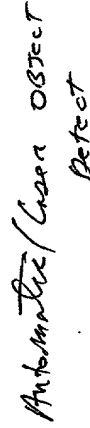


FIG. 40B3

252/332

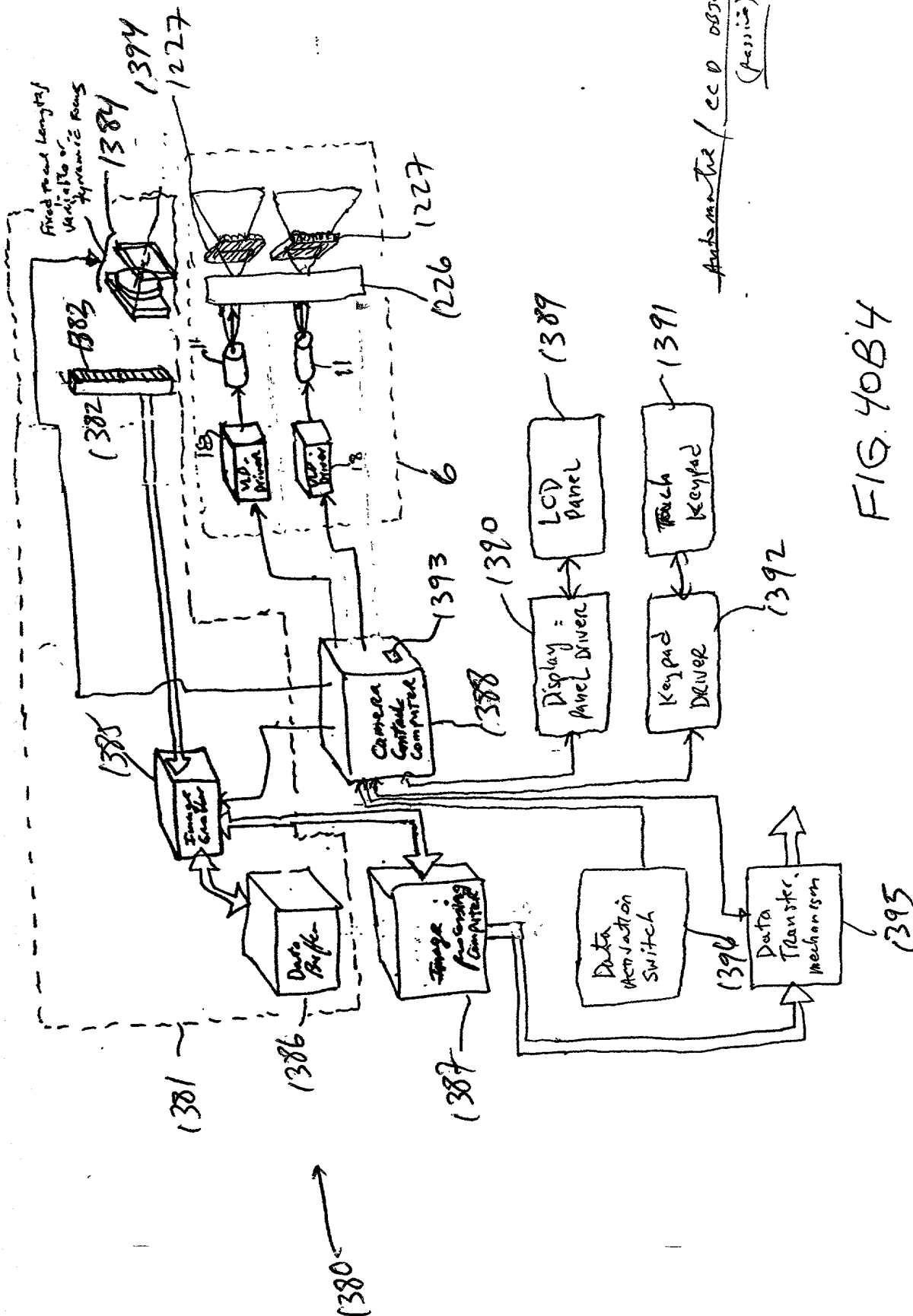


FIG. 40B4

209020" 0088900T

253/332

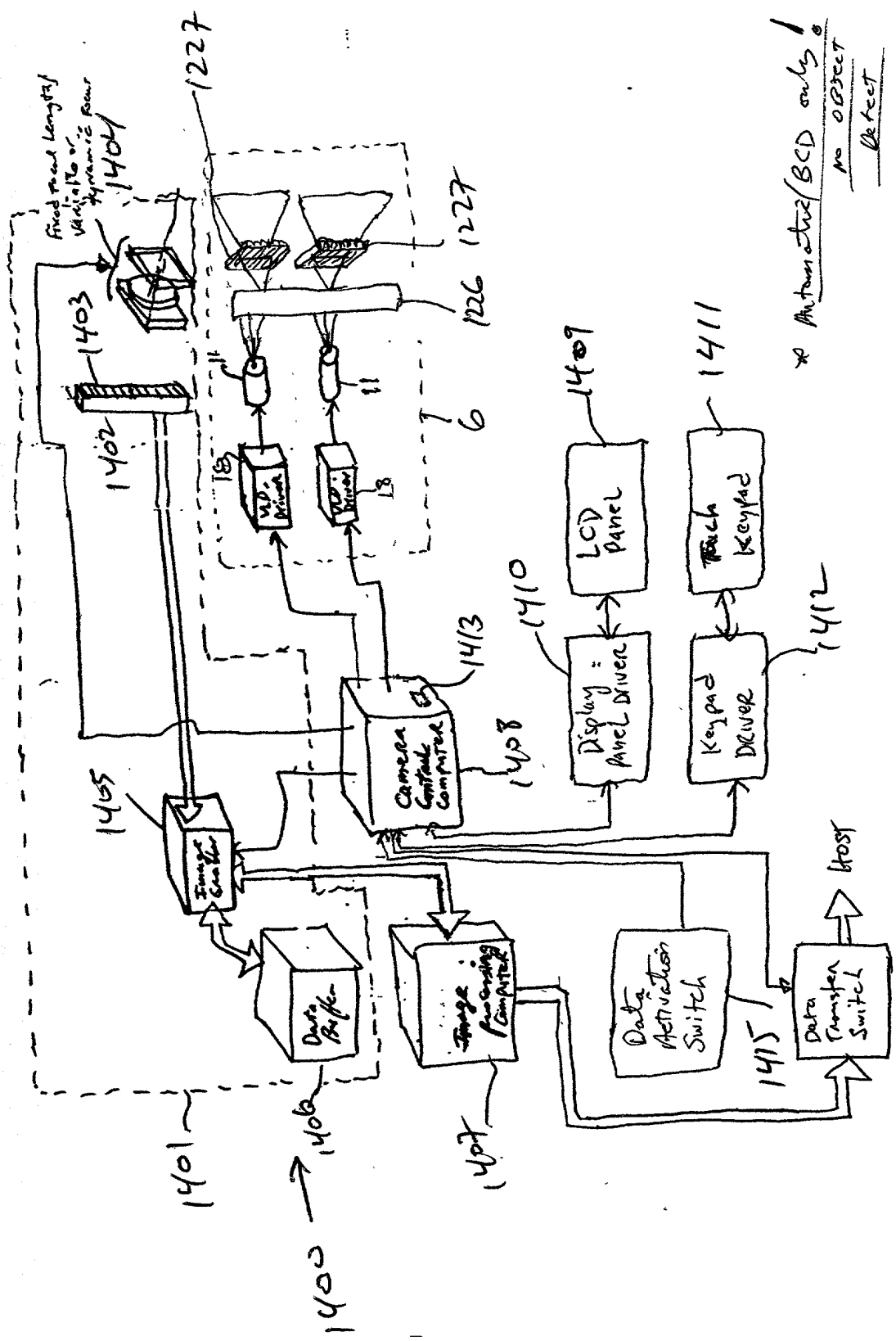
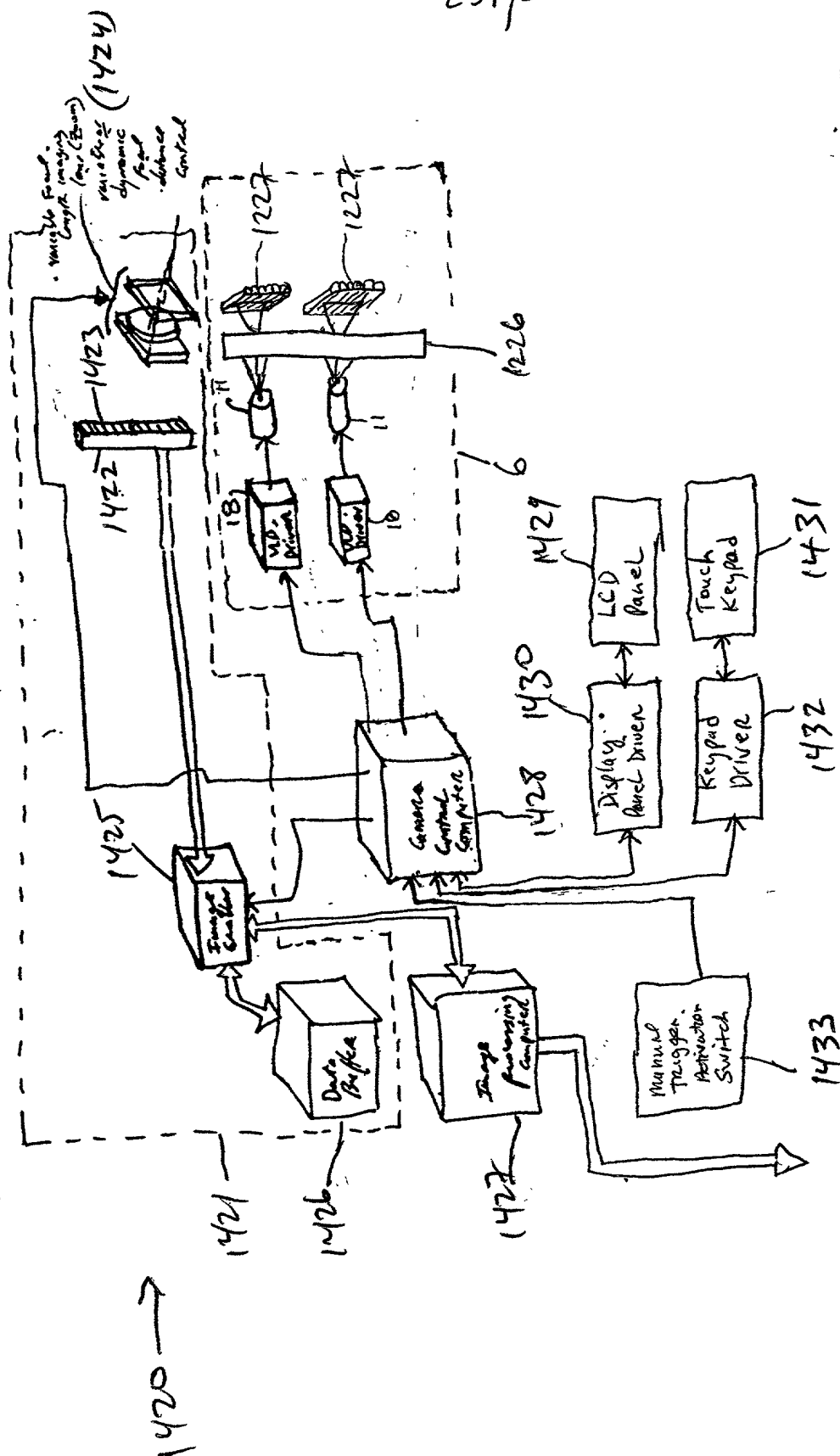


FIG. 40B5

1414





Manual Activation

FIG. 40C1

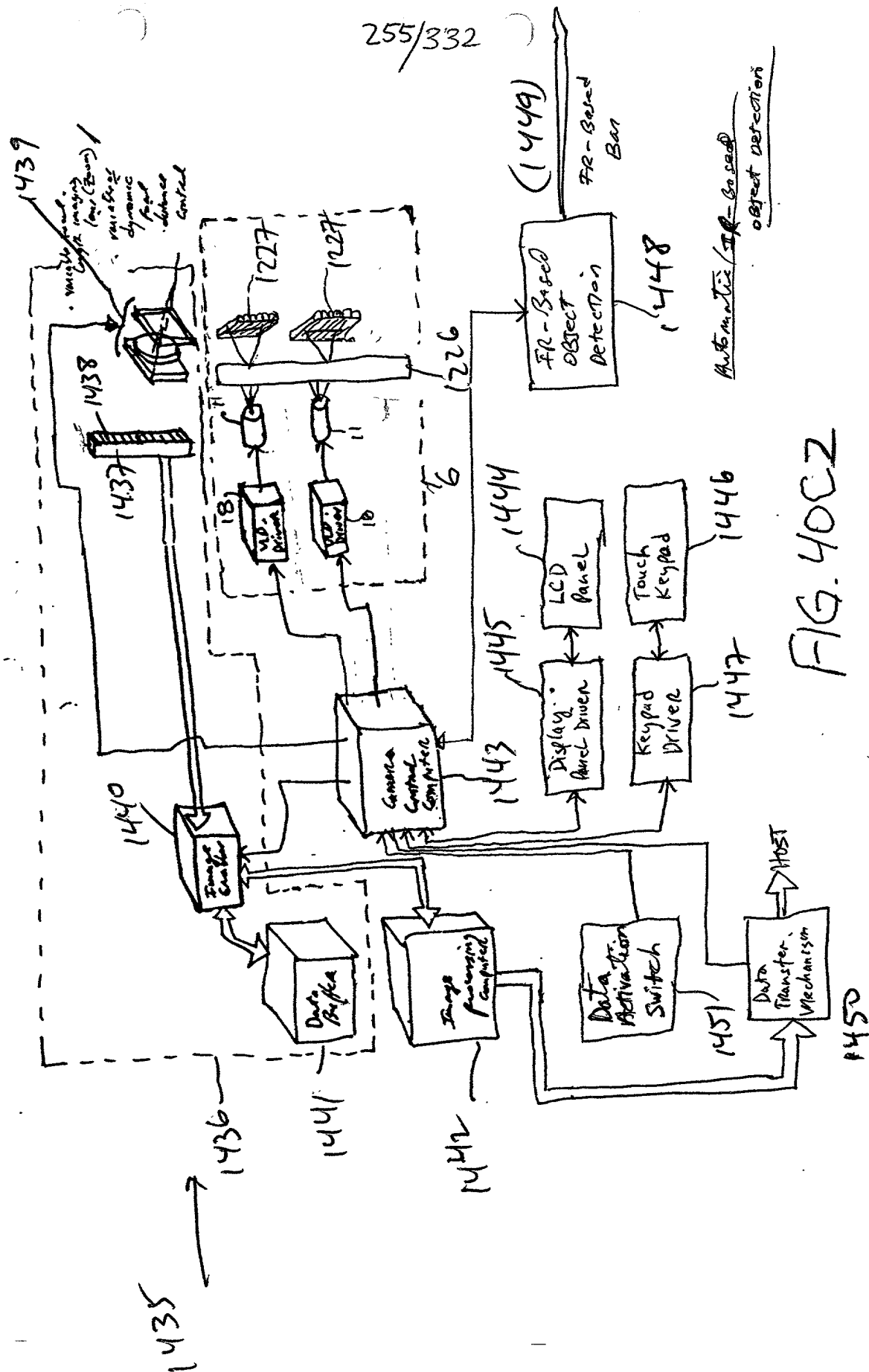


FIG. 40C2

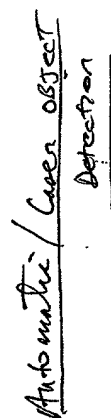


FIG. 40C3





20090210-2008900T

259/332

1-D  
display

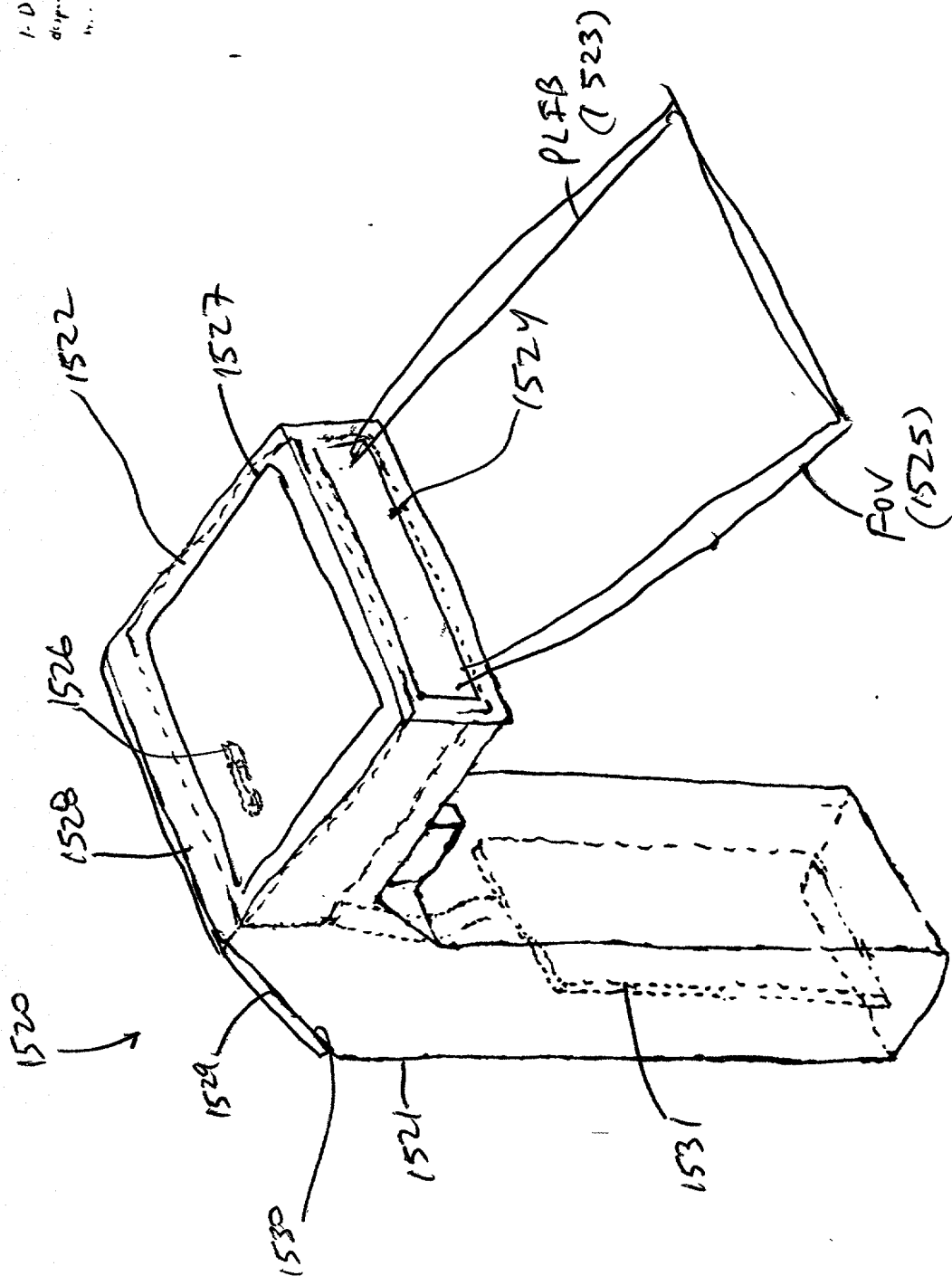


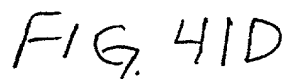
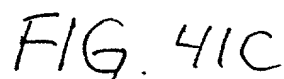
FIG. 41A

THE UNIVERSITY OF CHICAGO



FIG. 41B

THE UNIVERSITY OF CHICAGO  
 LIBRARY  
 540 EAST 57TH STREET  
 CHICAGO, ILL. 60637  
 TEL: 773-936-5000  
 FAX: 773-936-5000  
 WWW: WWW.CHICAGO.EDU





1-0  
disposition,  
by, of, ...

FIG. 42A

FIG. 42A

263/332

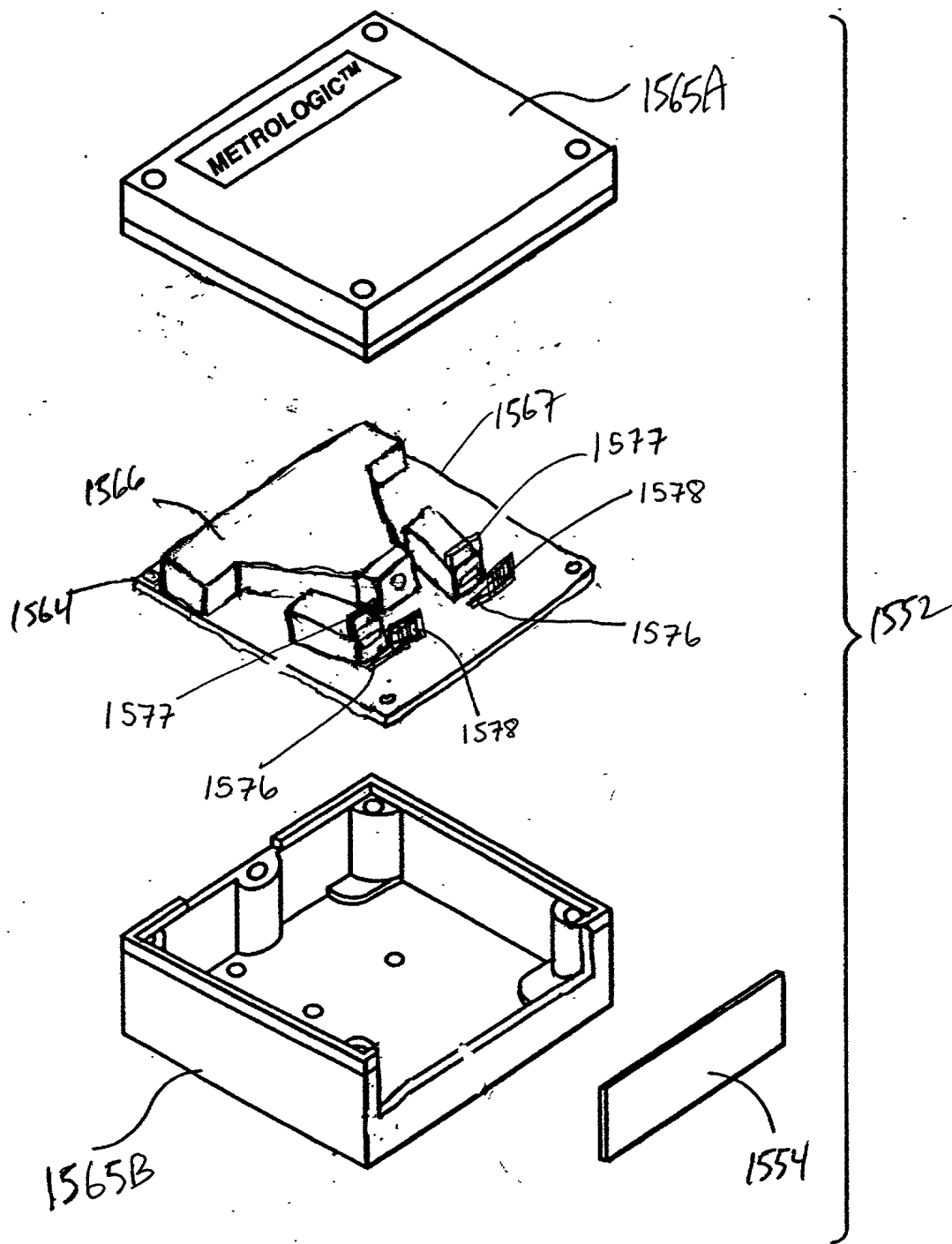
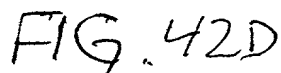
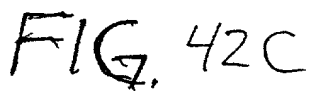


FIG. 42B

SECRET



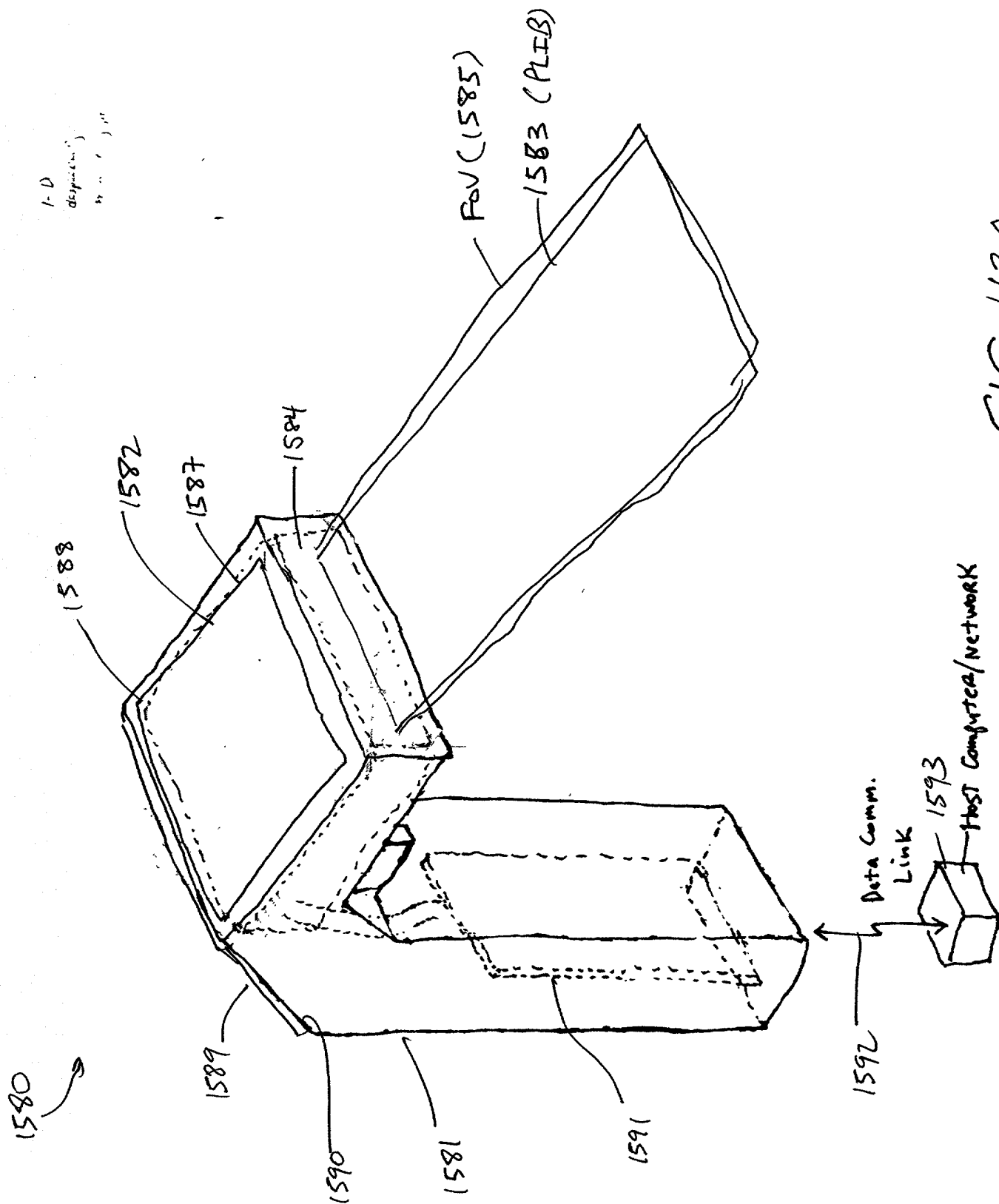
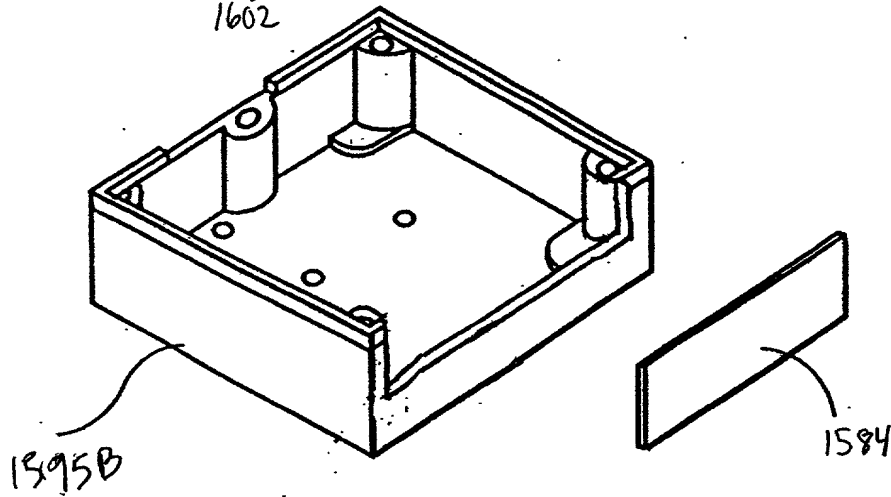
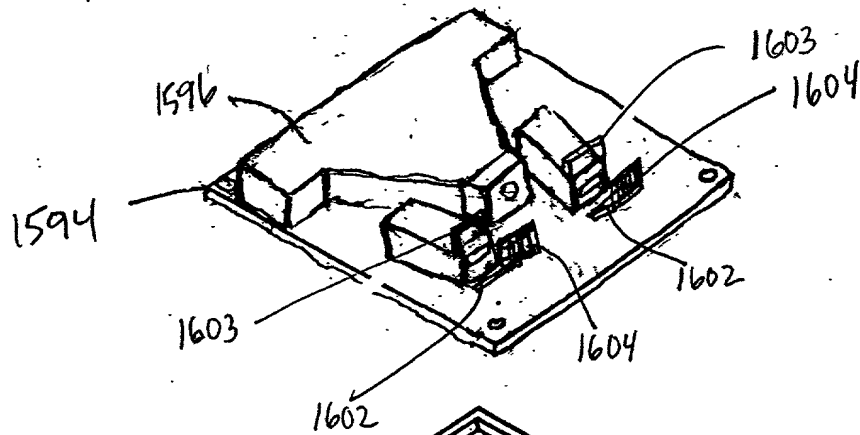
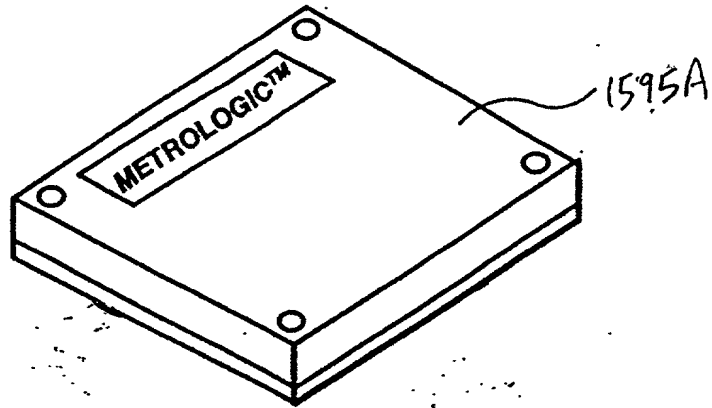


FIG. 43A

266/332



1582

FIG. 43B

267/332

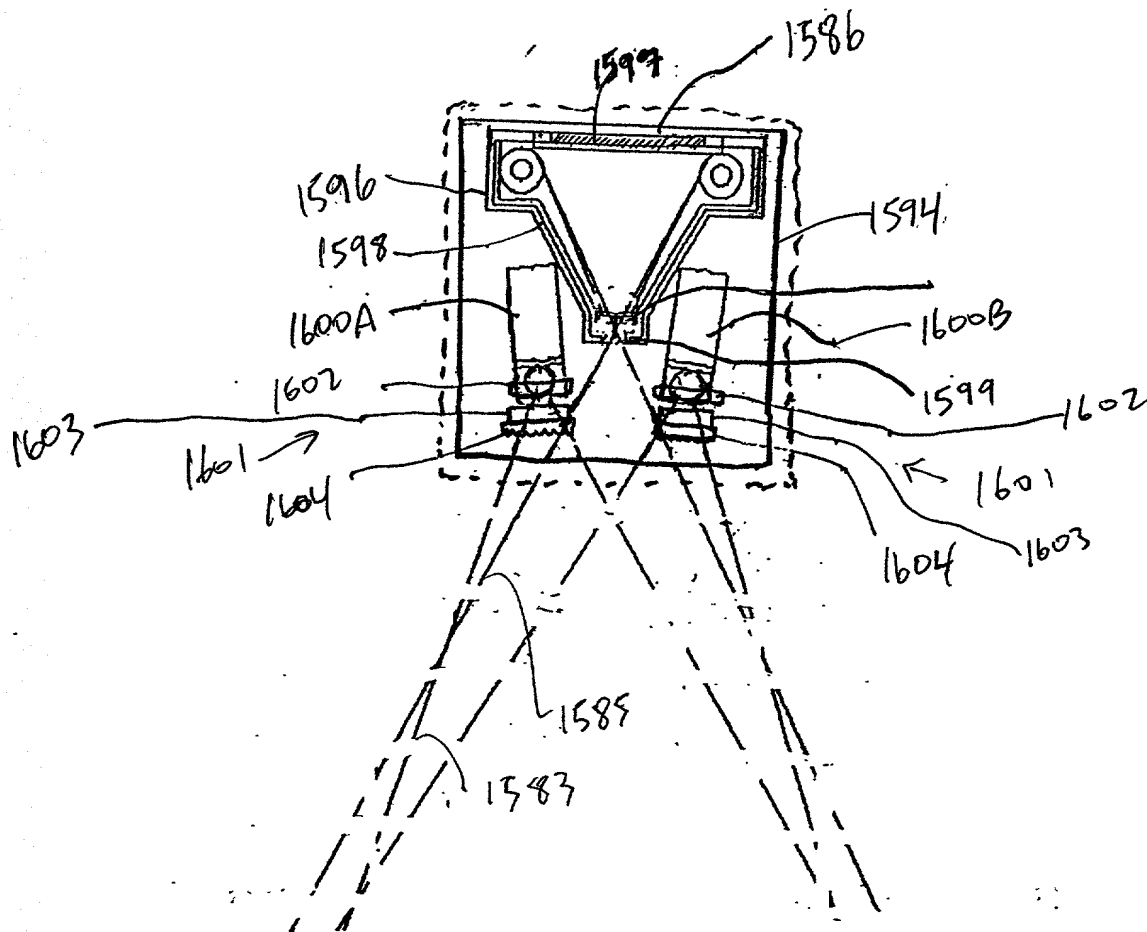


FIG. 43C

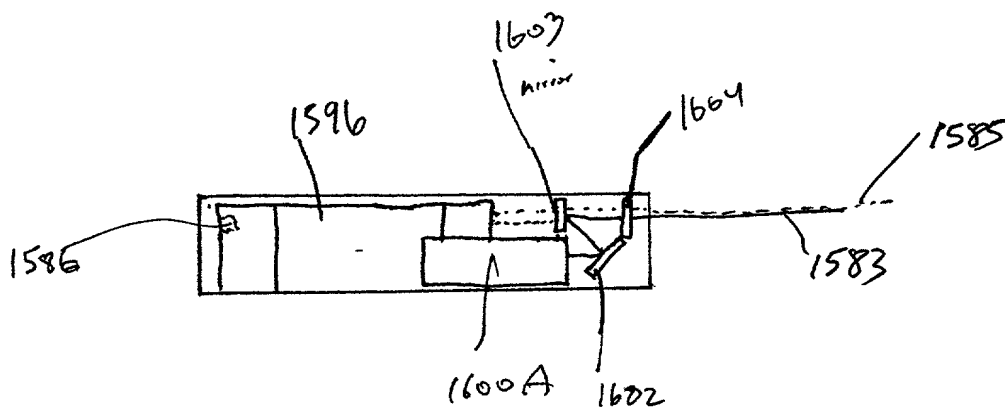


FIG. 43D

200603-020602



269/332

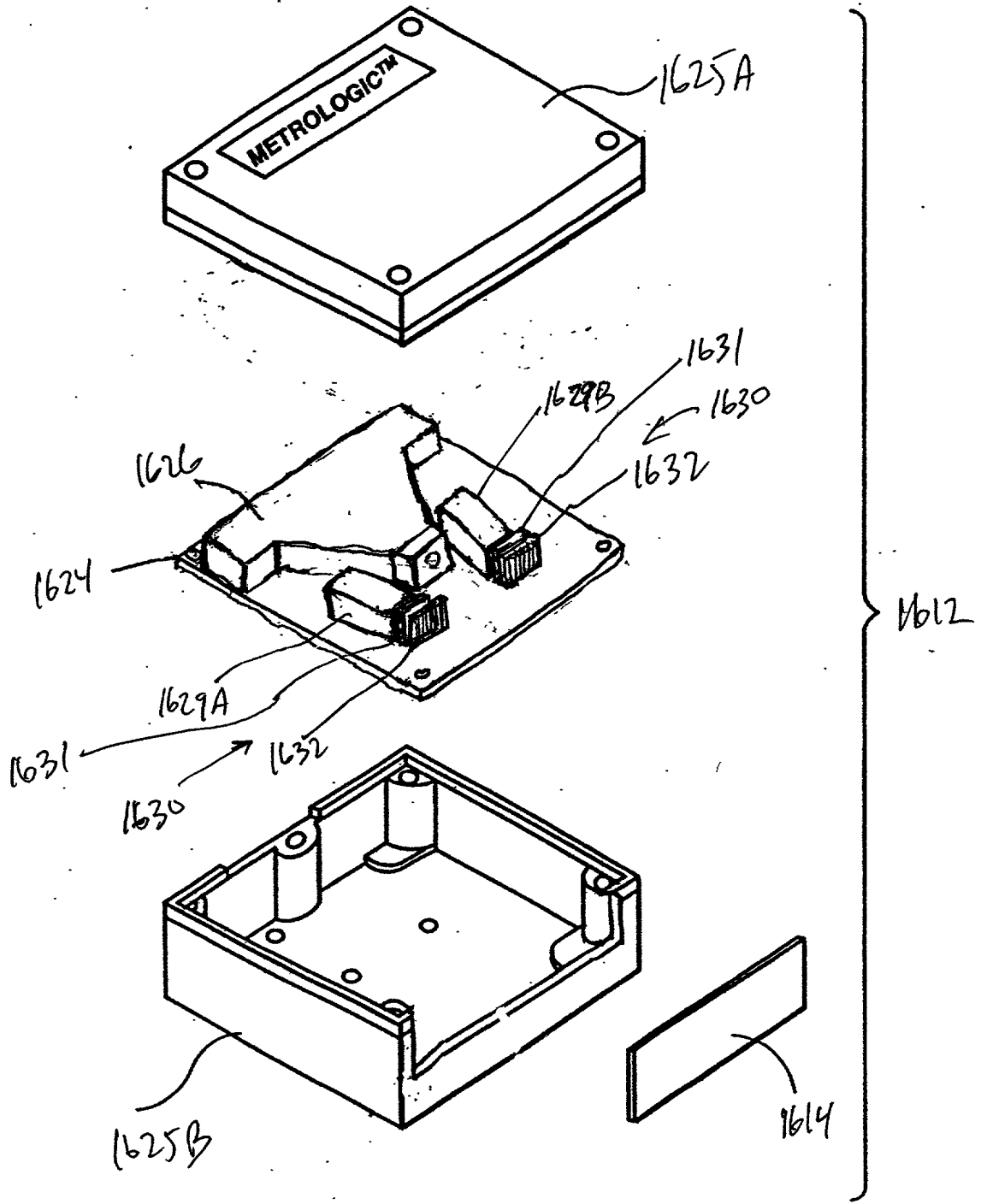


FIG. 44B



270/332

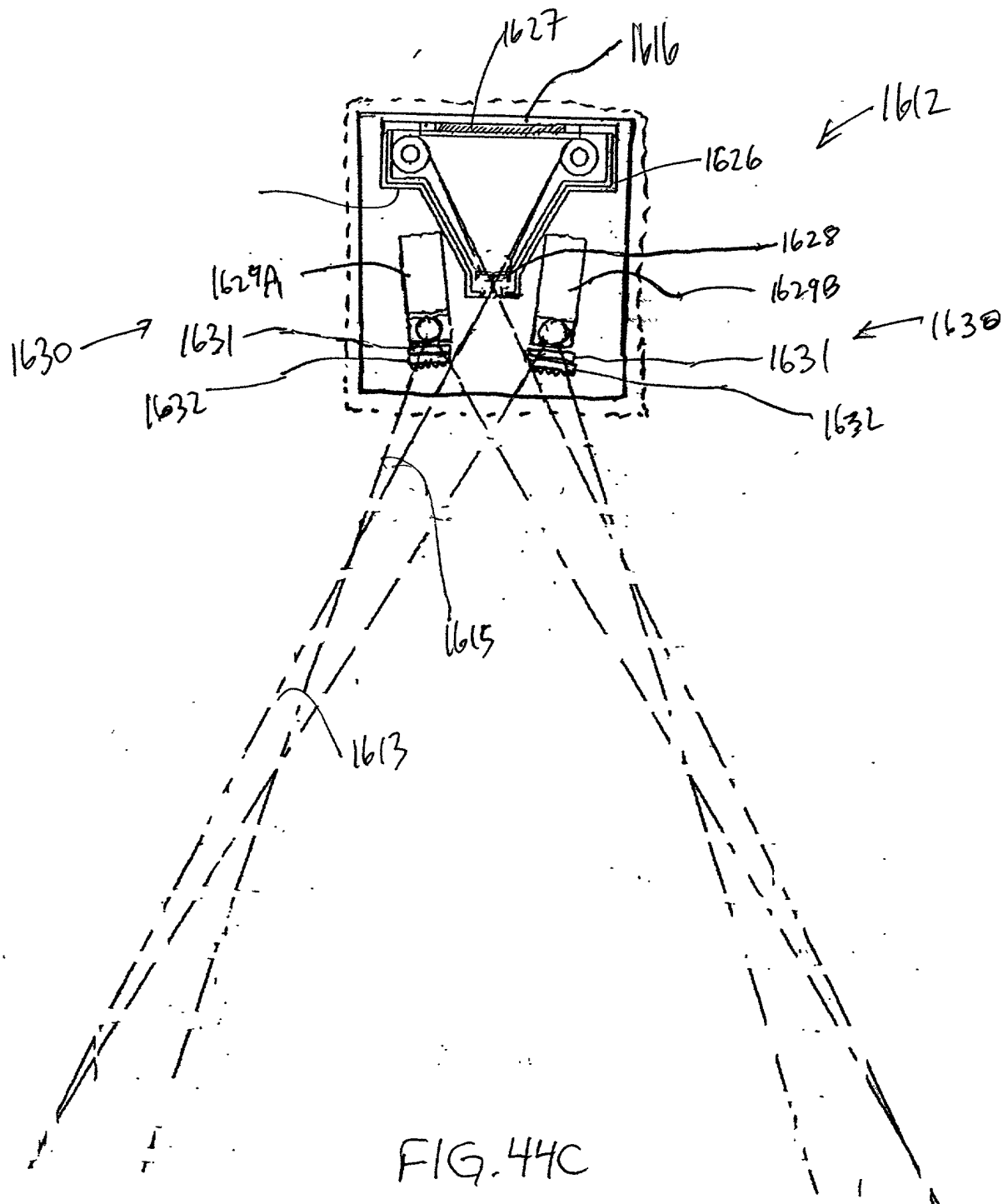


FIG. 44C

2099020-20999001



272/332

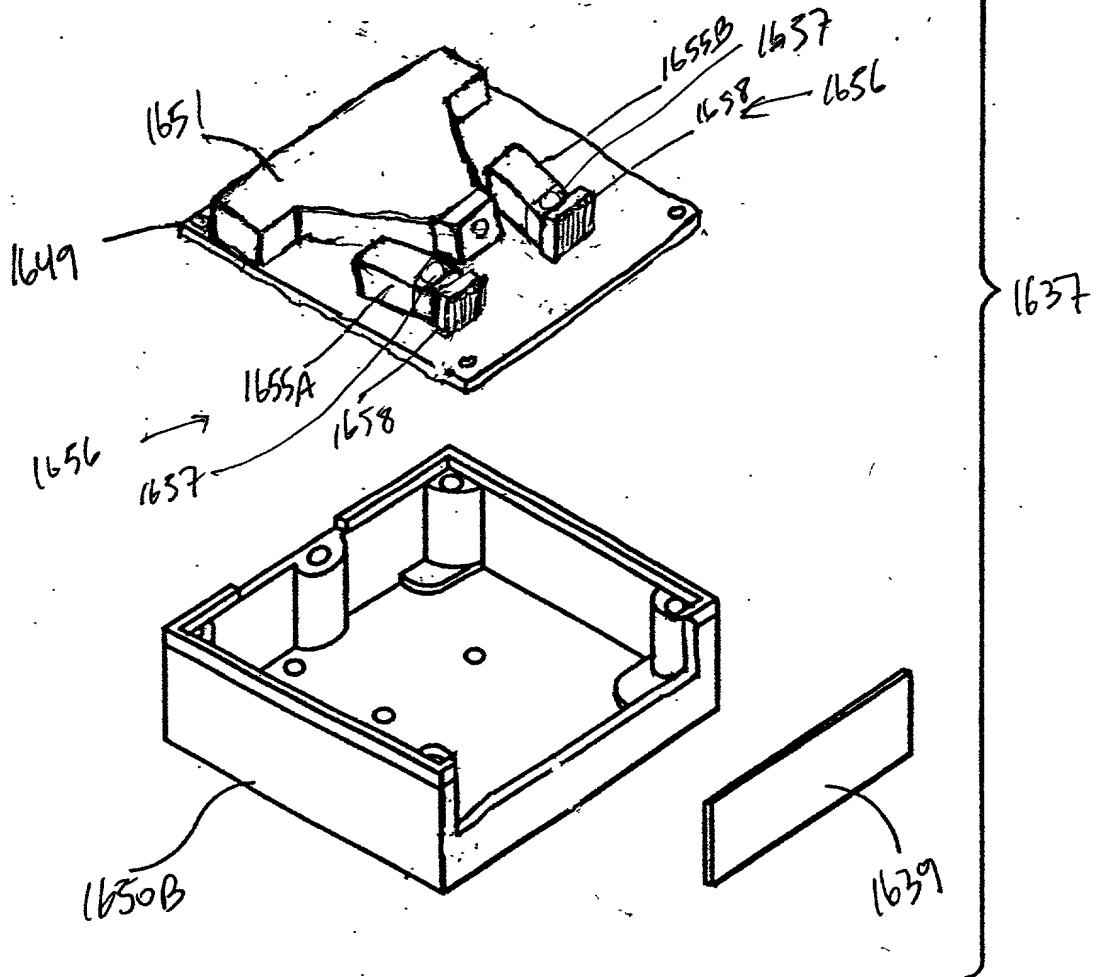
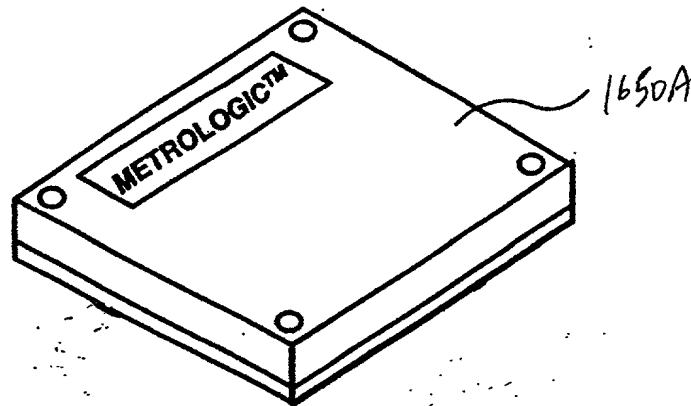
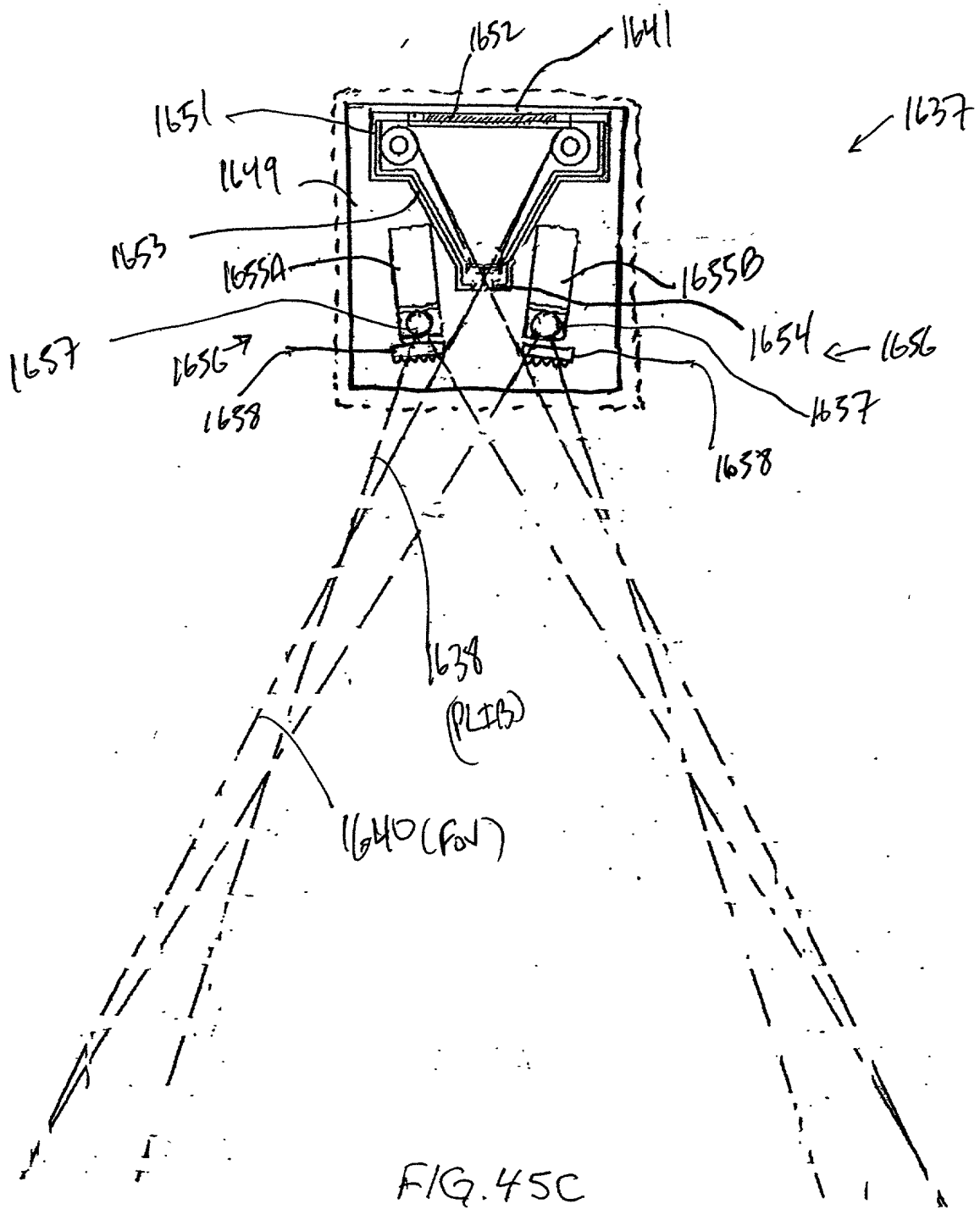


FIG. 45B

10068803-020602

273/332



10068803-020602

2009020" 0088900T

274/332

1-D  
display  
...

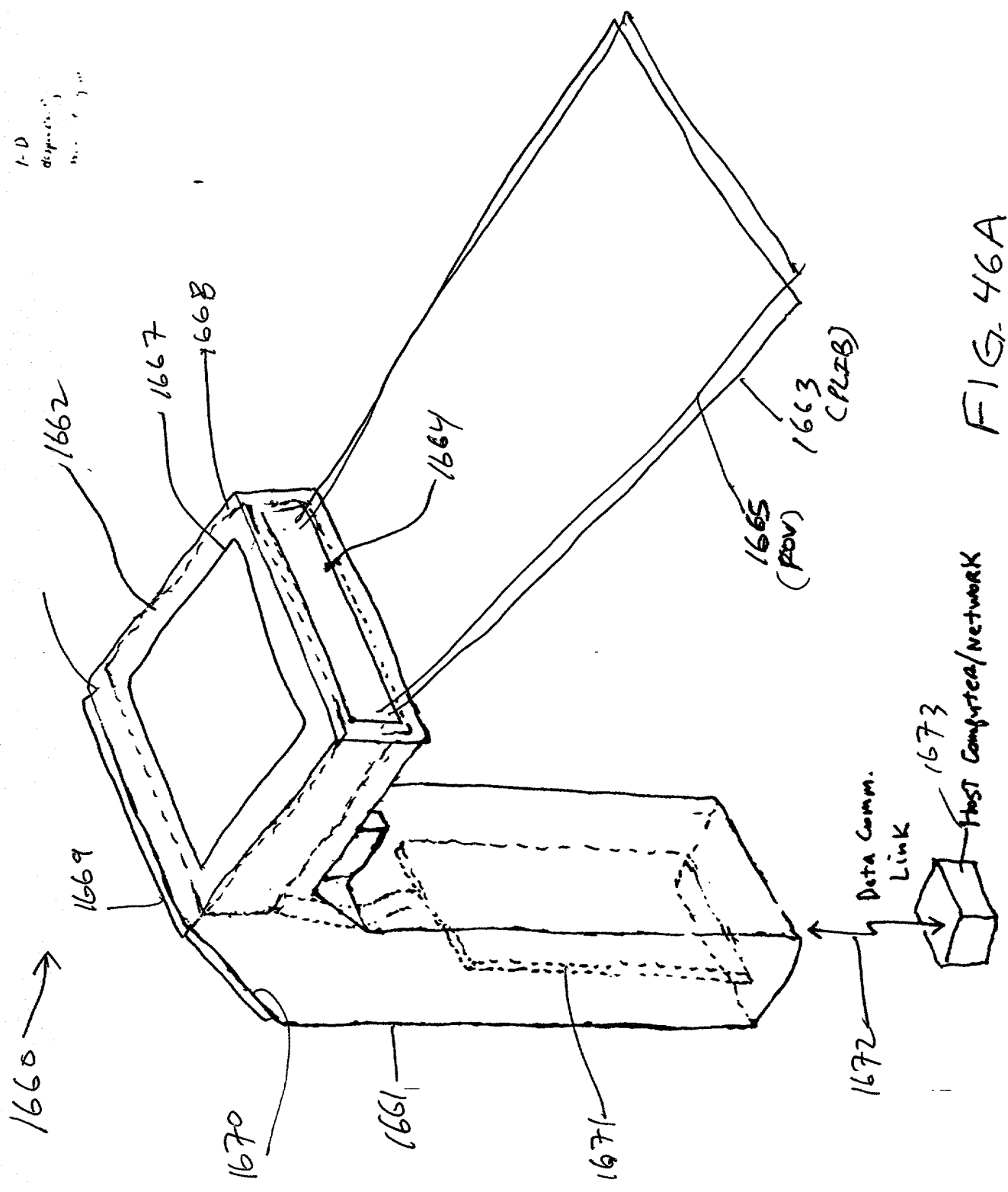


FIG. 46A

275/332

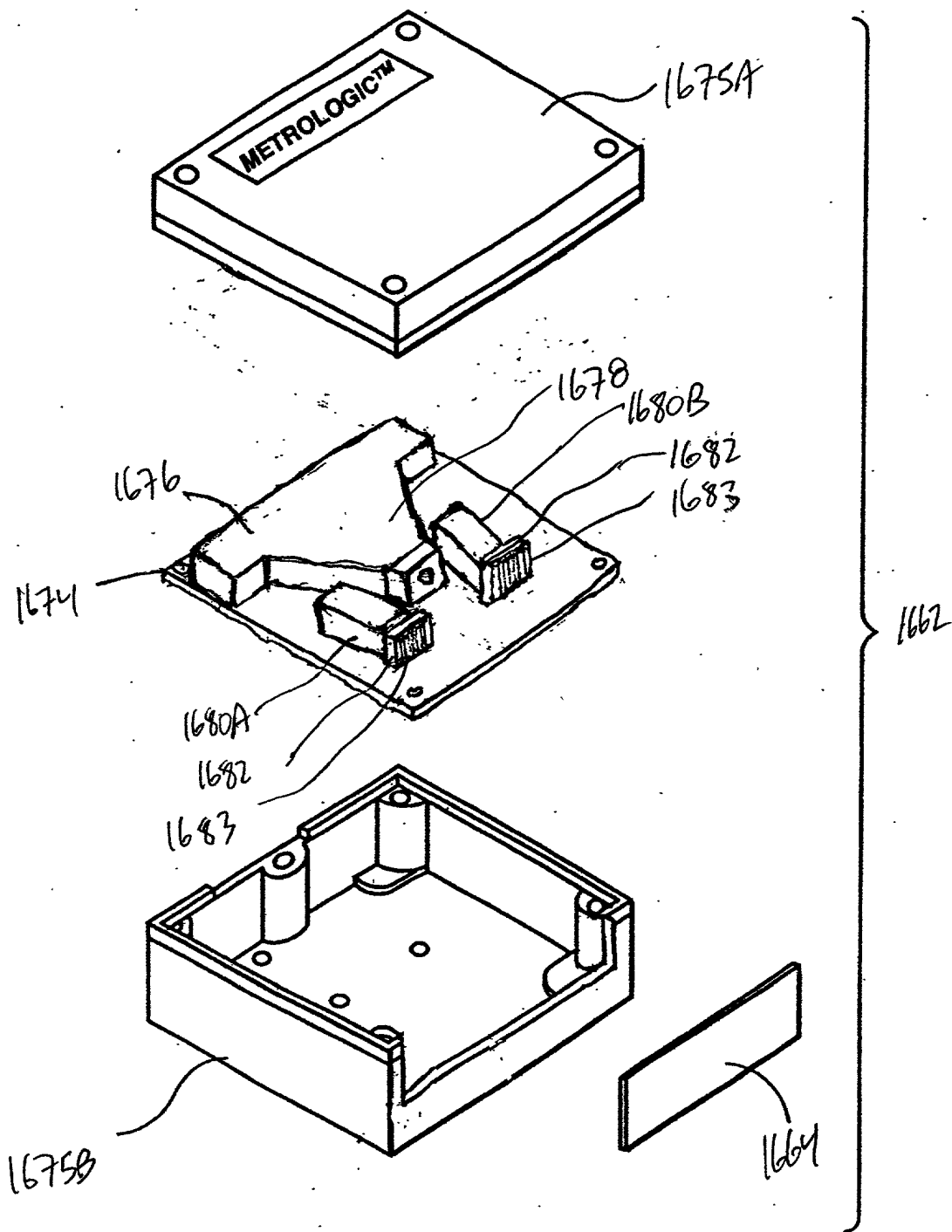
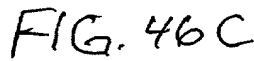


FIG. 46B

THE UNIVERSITY OF CHICAGO  
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540 EAST 57TH STREET  
CHICAGO, ILL. 60637  
TEL: 773-936-5000  
FAX: 773-936-5001  
WWW.CHICAGO.EDU



277/332

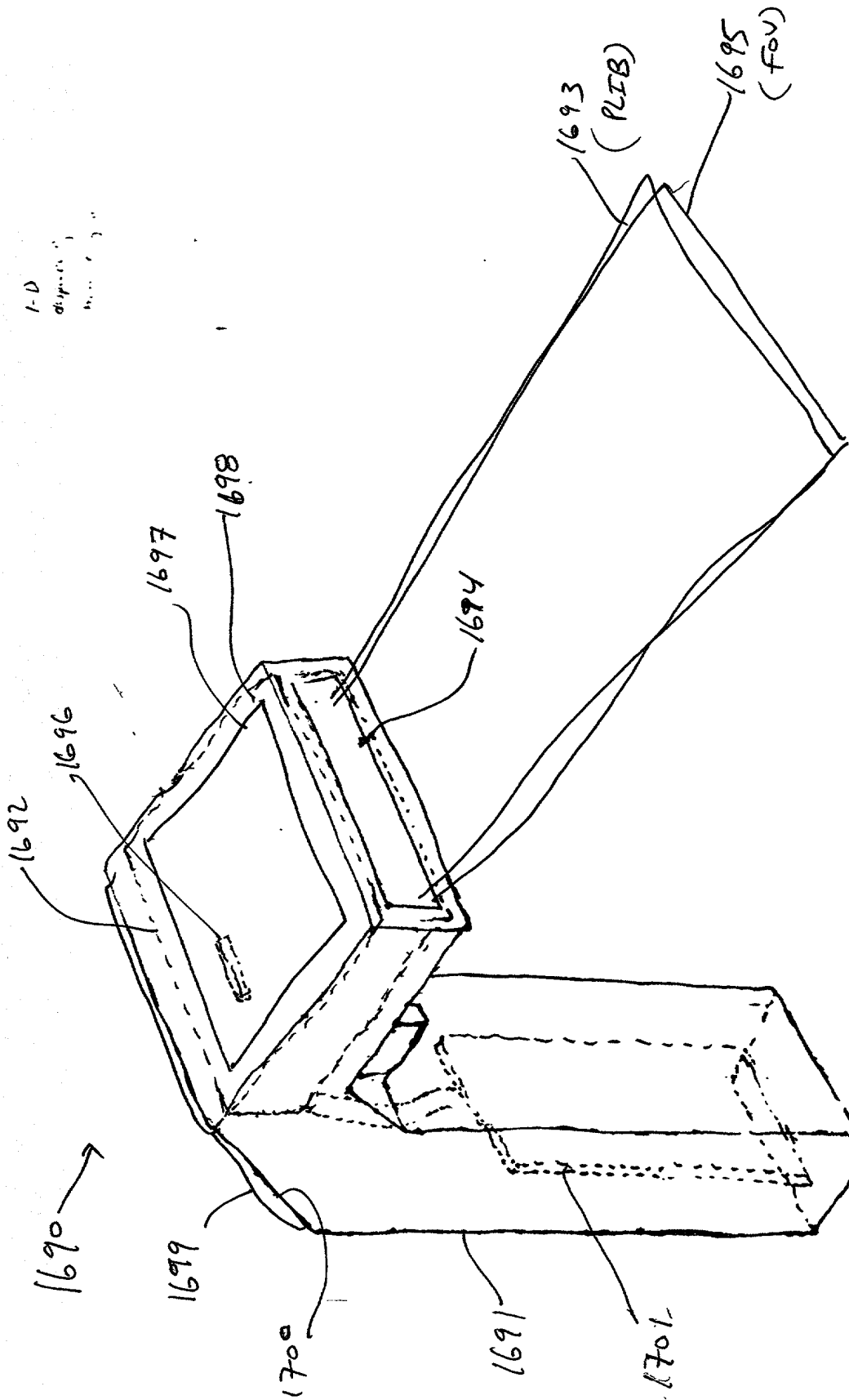


FIG. 47A



278/332

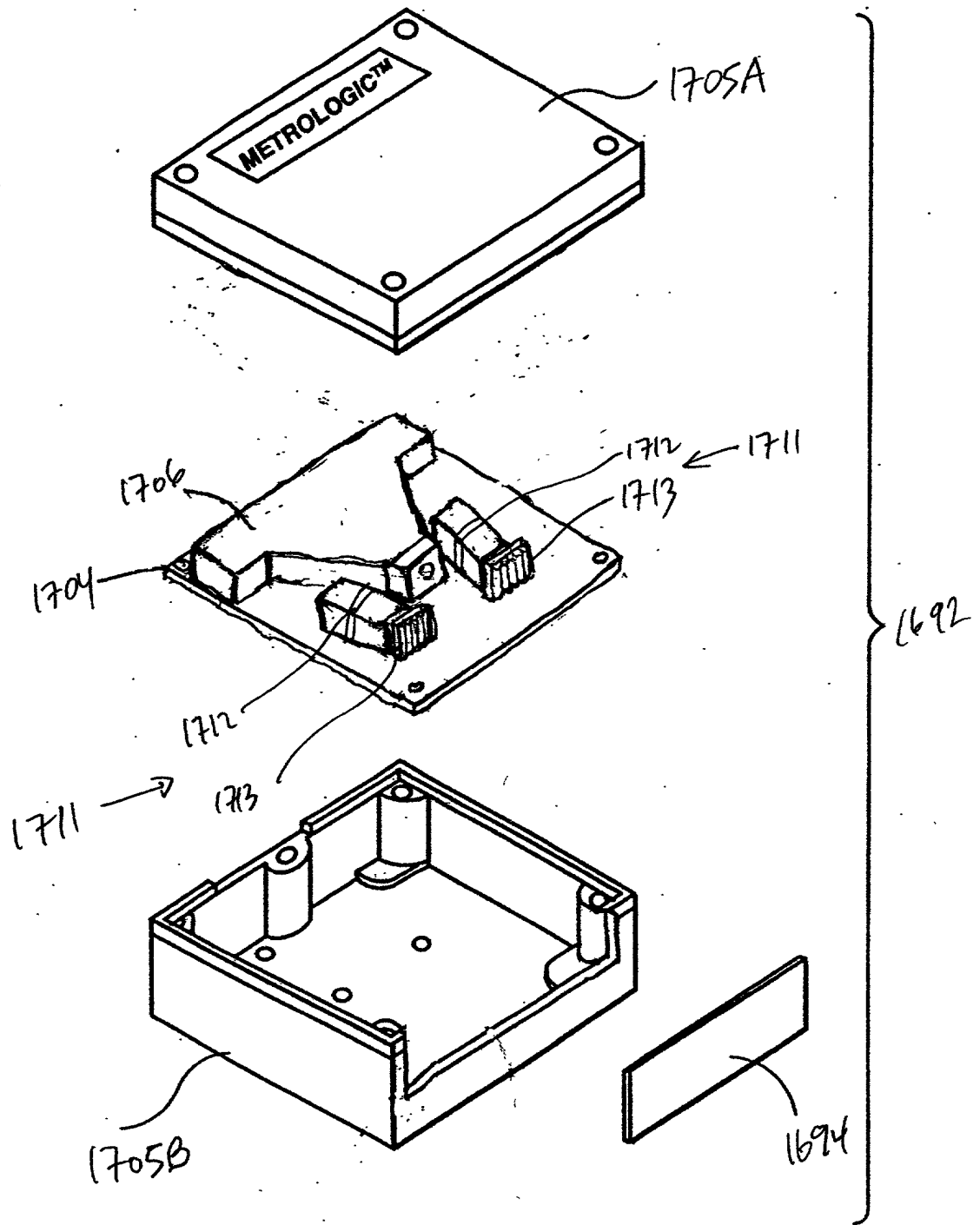


FIG. 47B

279/332

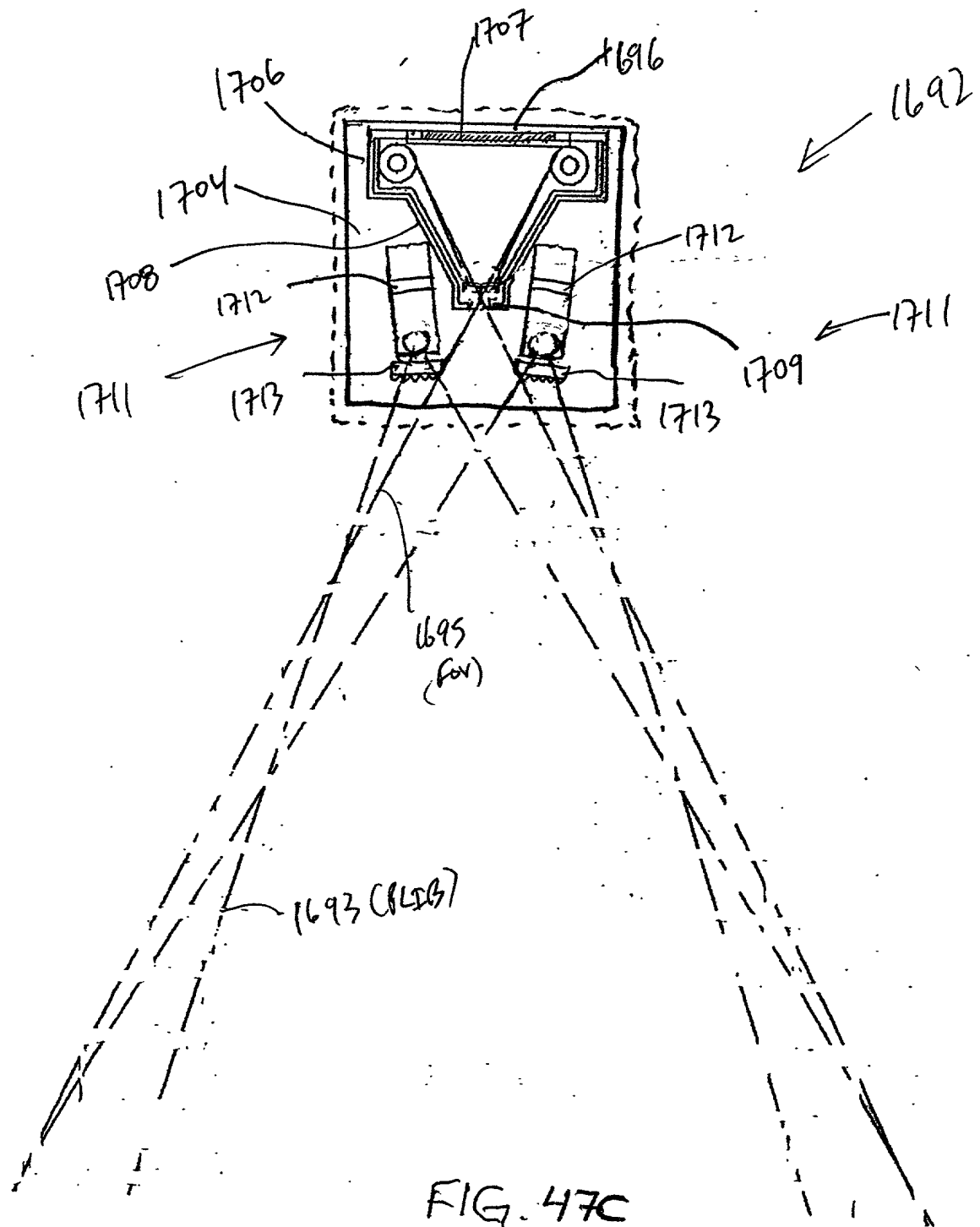


FIG. 47C

10068803-020602

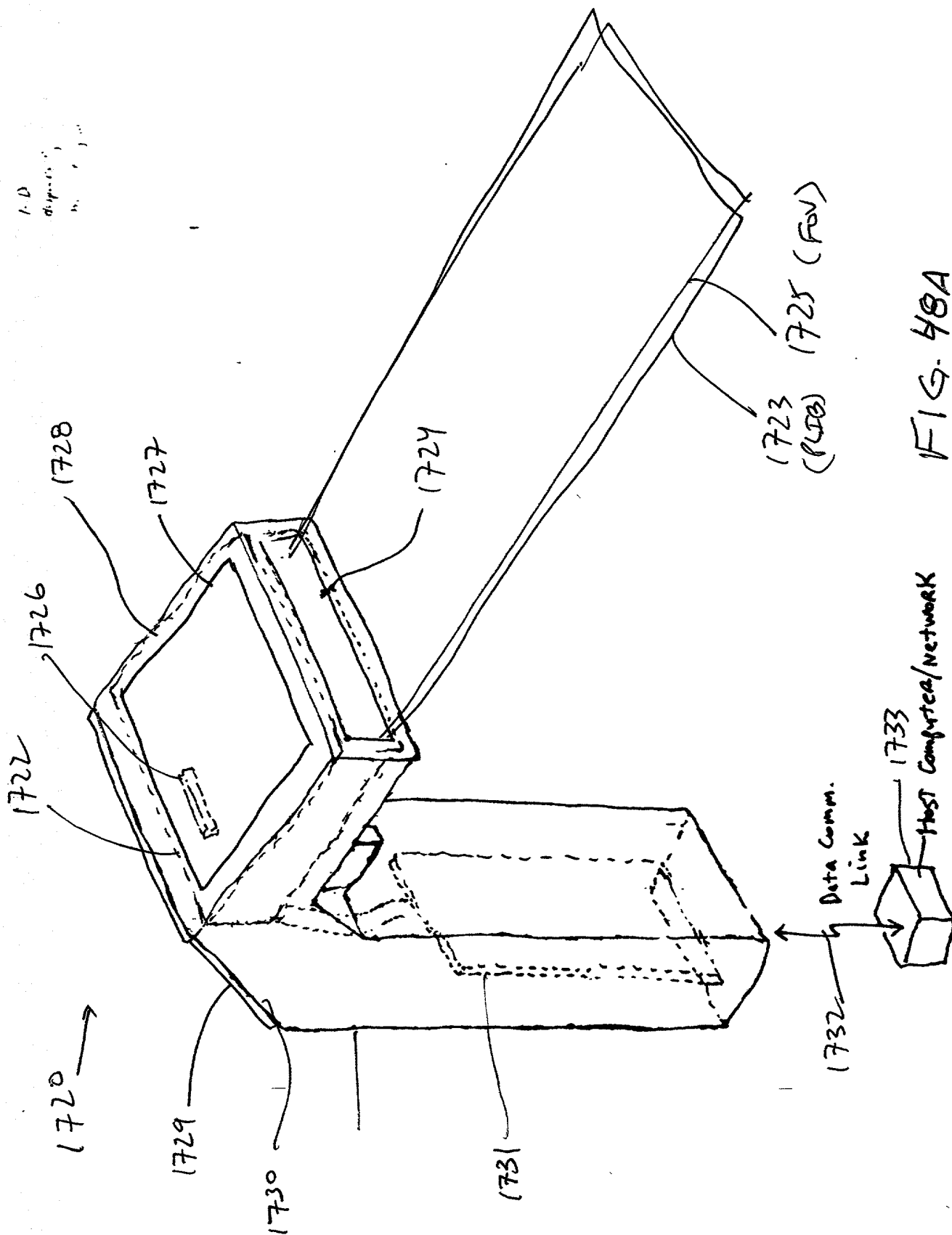


FIG. 48A

281/332

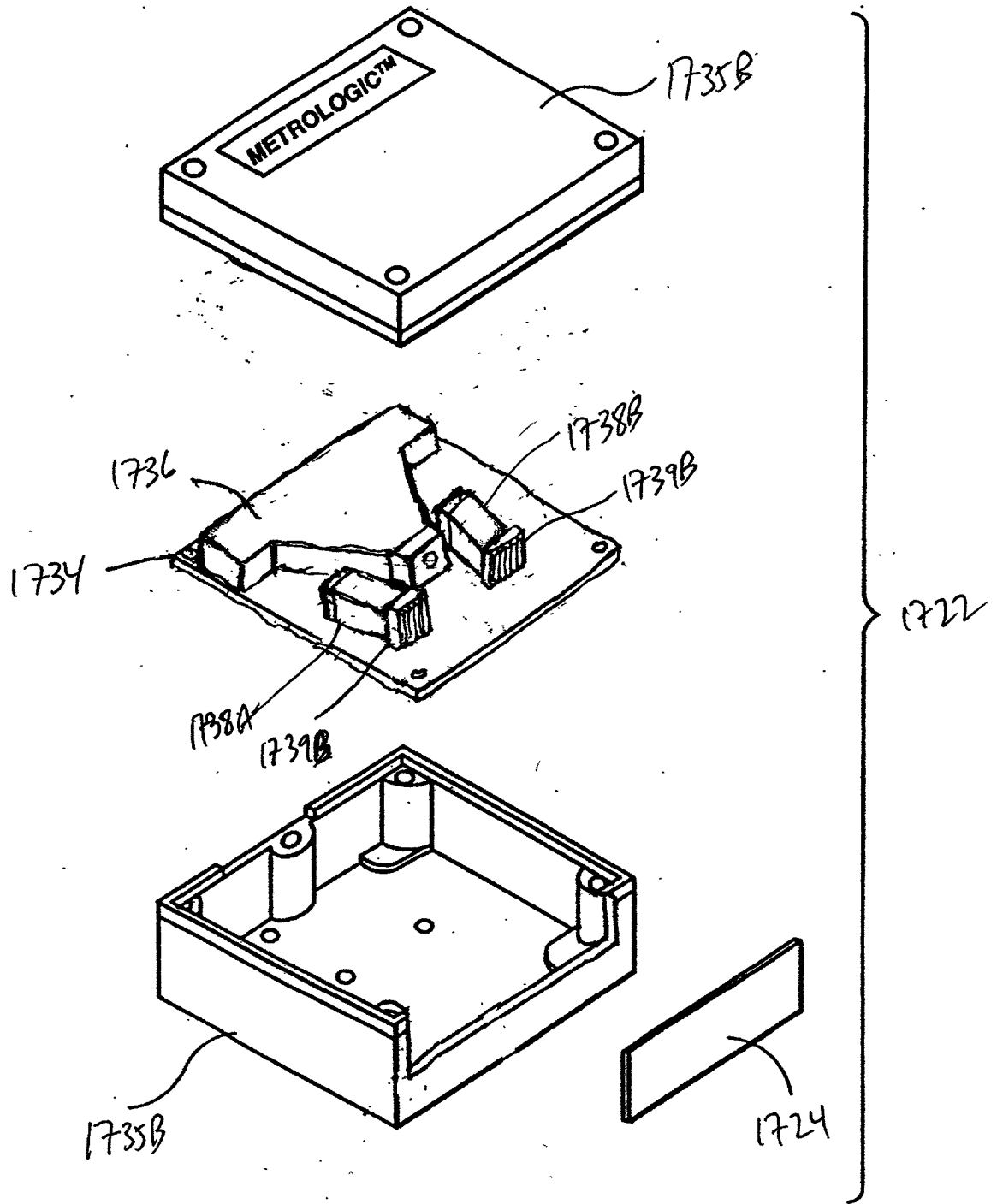


FIG. 48B

282/332

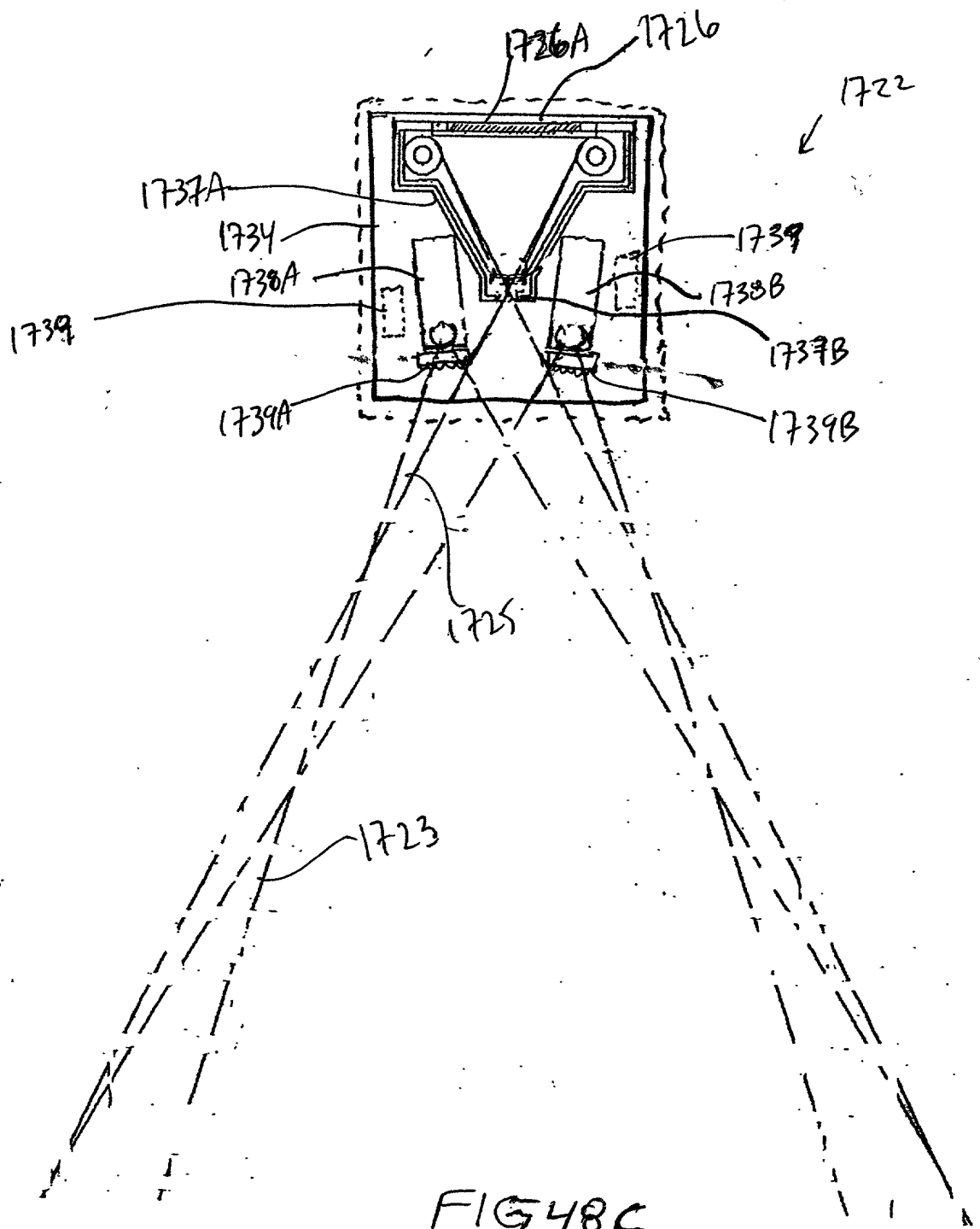


FIG. 48C

10068803.020602

2009020-020602

1-D  
display  
...

283/332

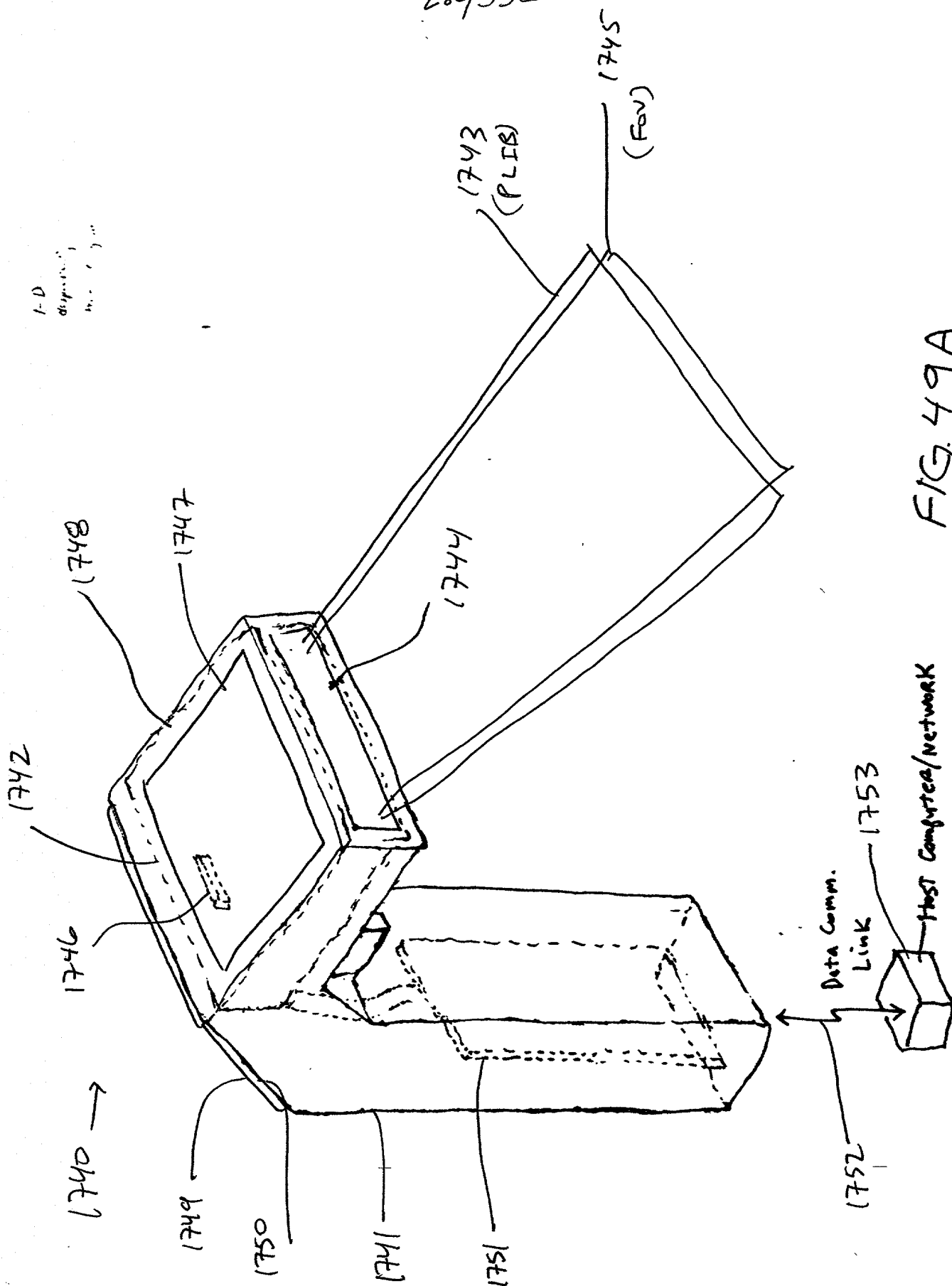


FIG. 49A

284/332

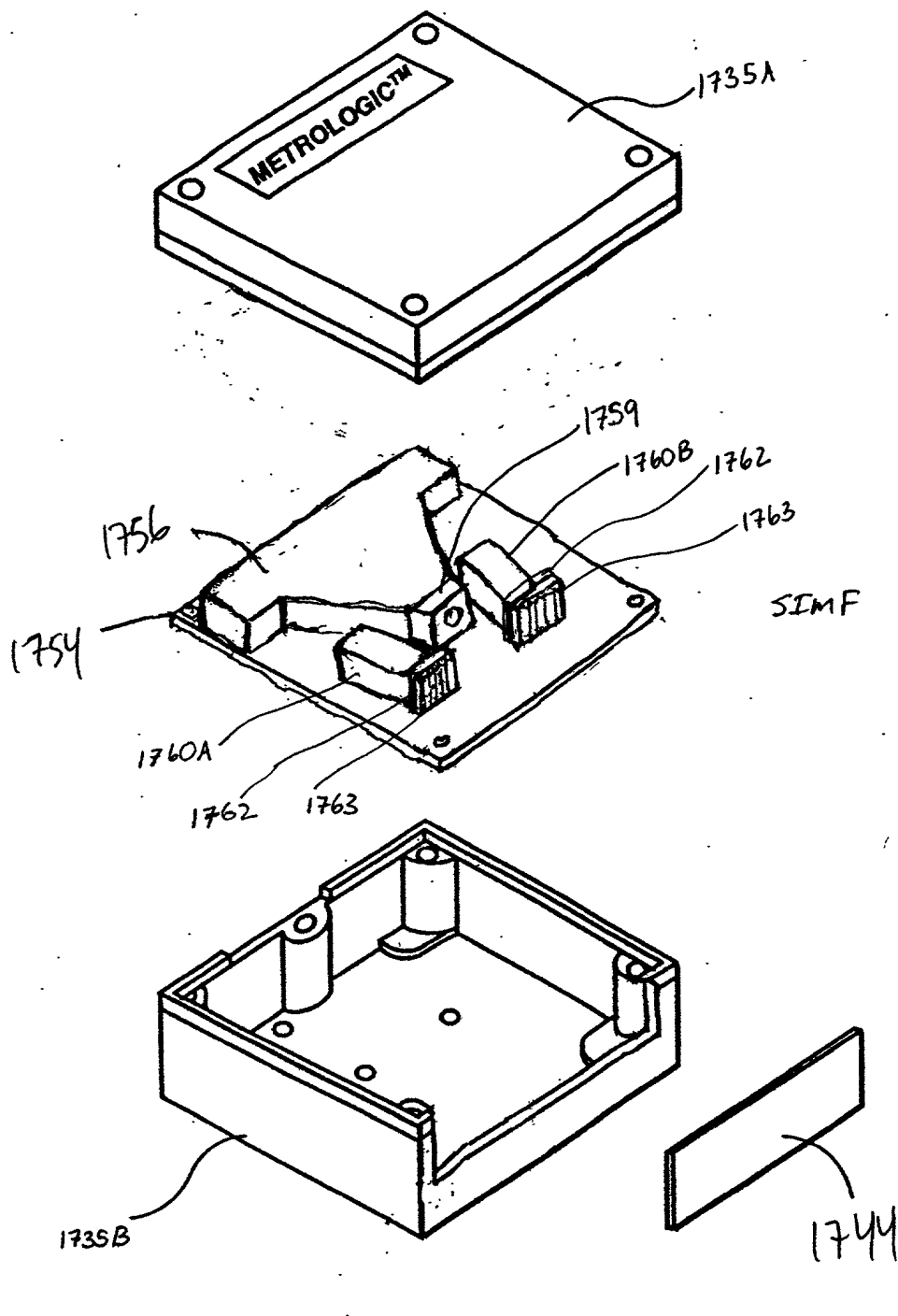


FIG. 49B

285/332

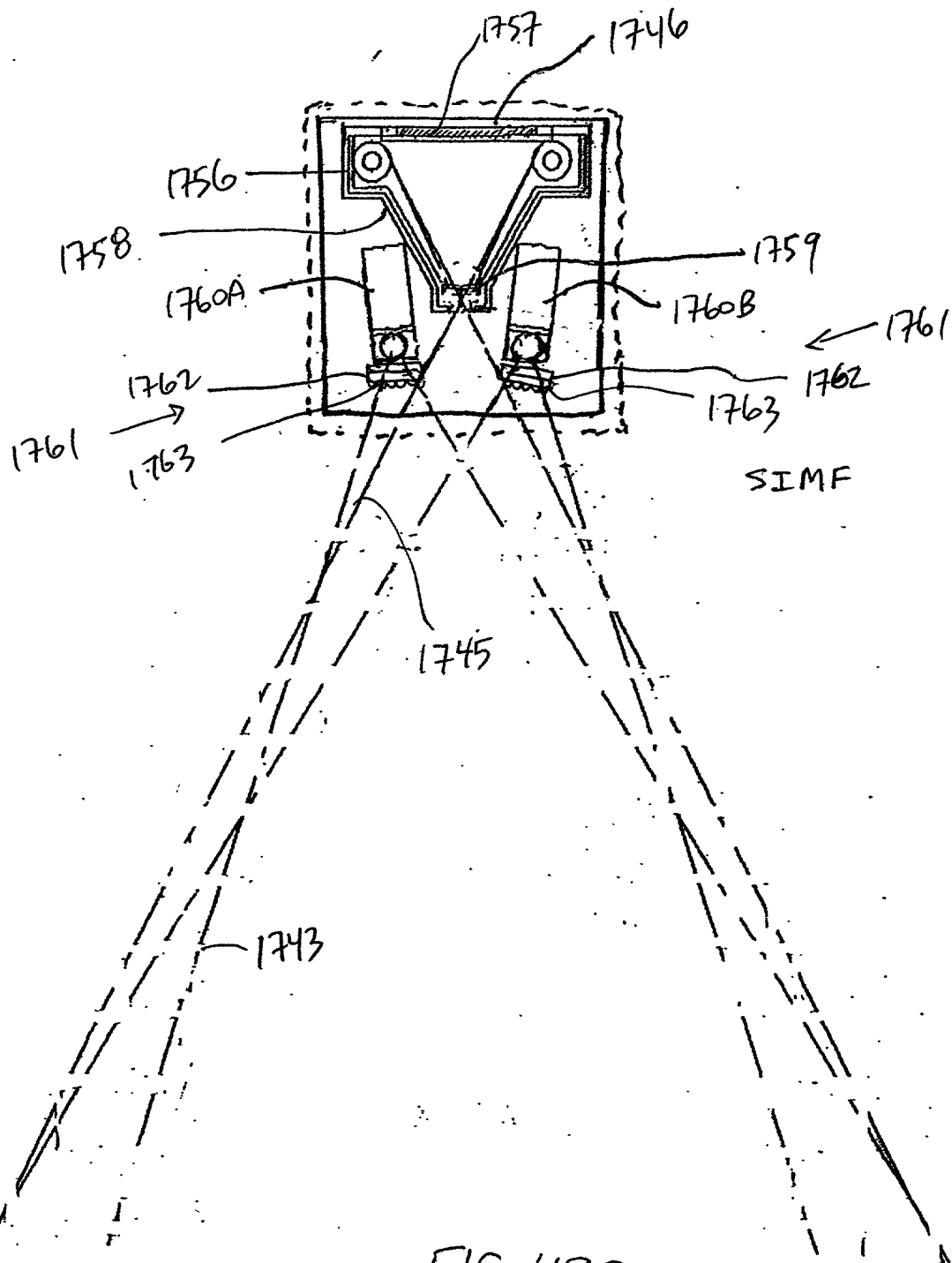
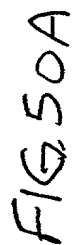


FIG. 49C

10068803.020602





287/332

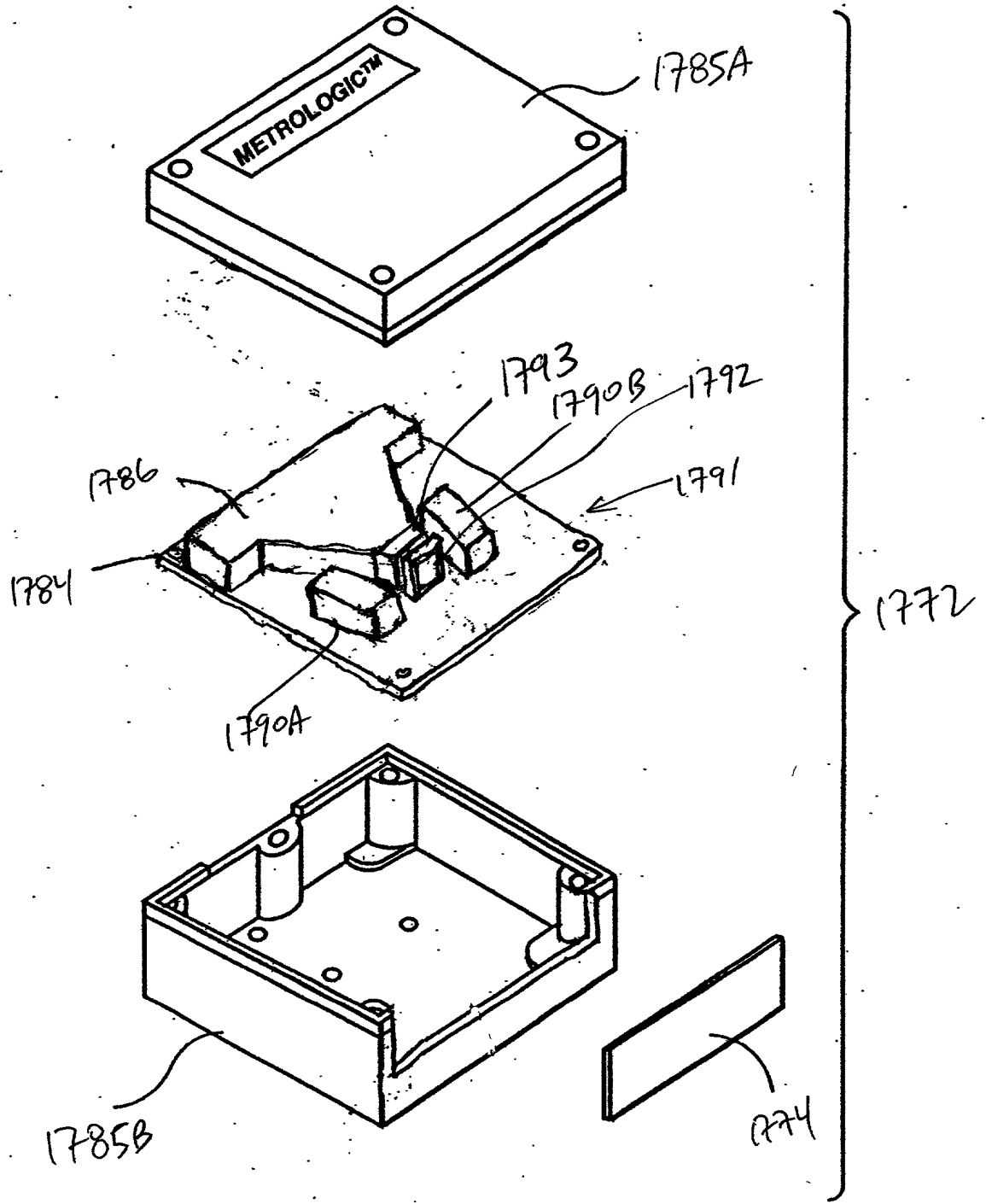


FIG. 50B

288/332

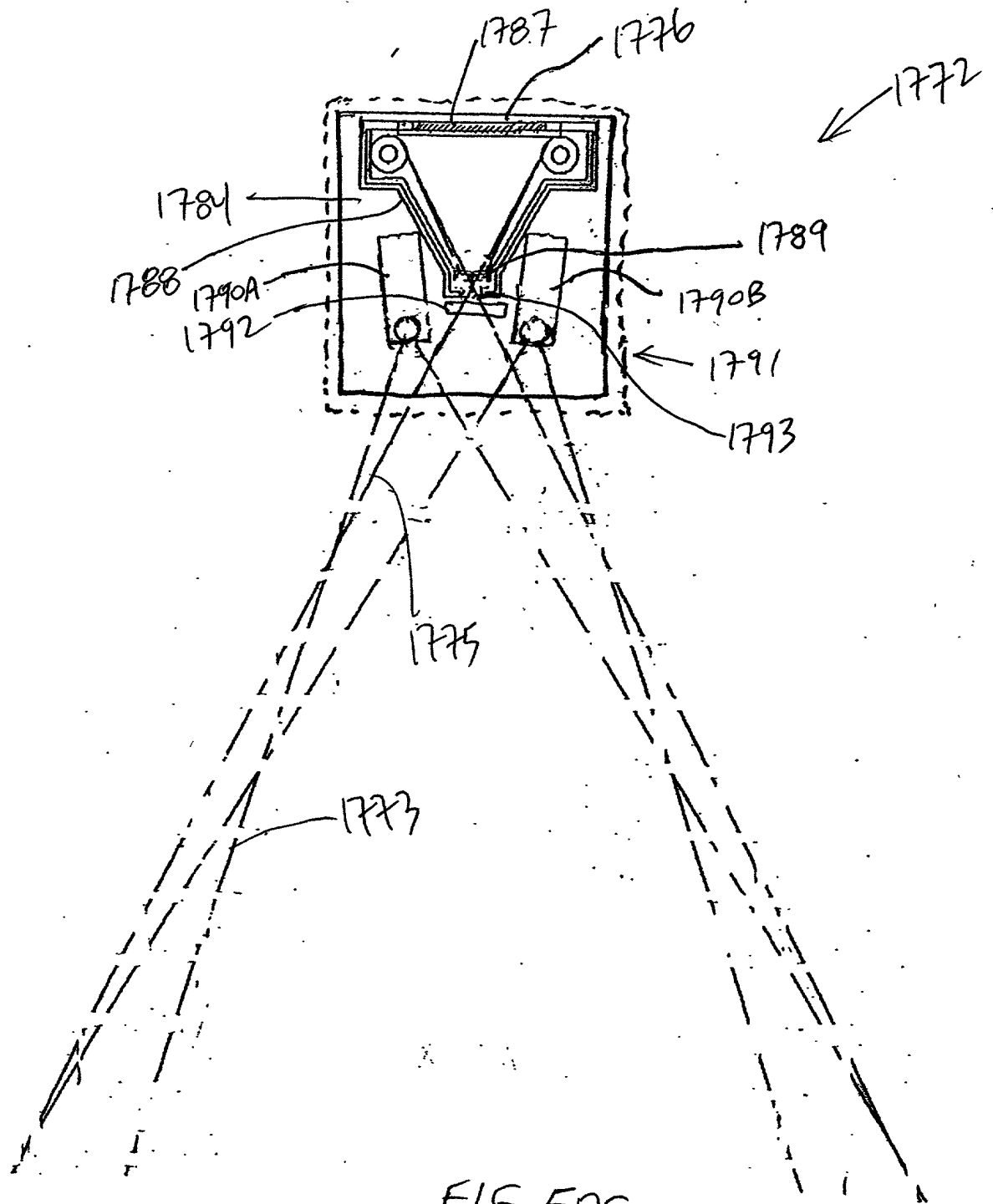


FIG. 50C

2009-08-03 10:00:00

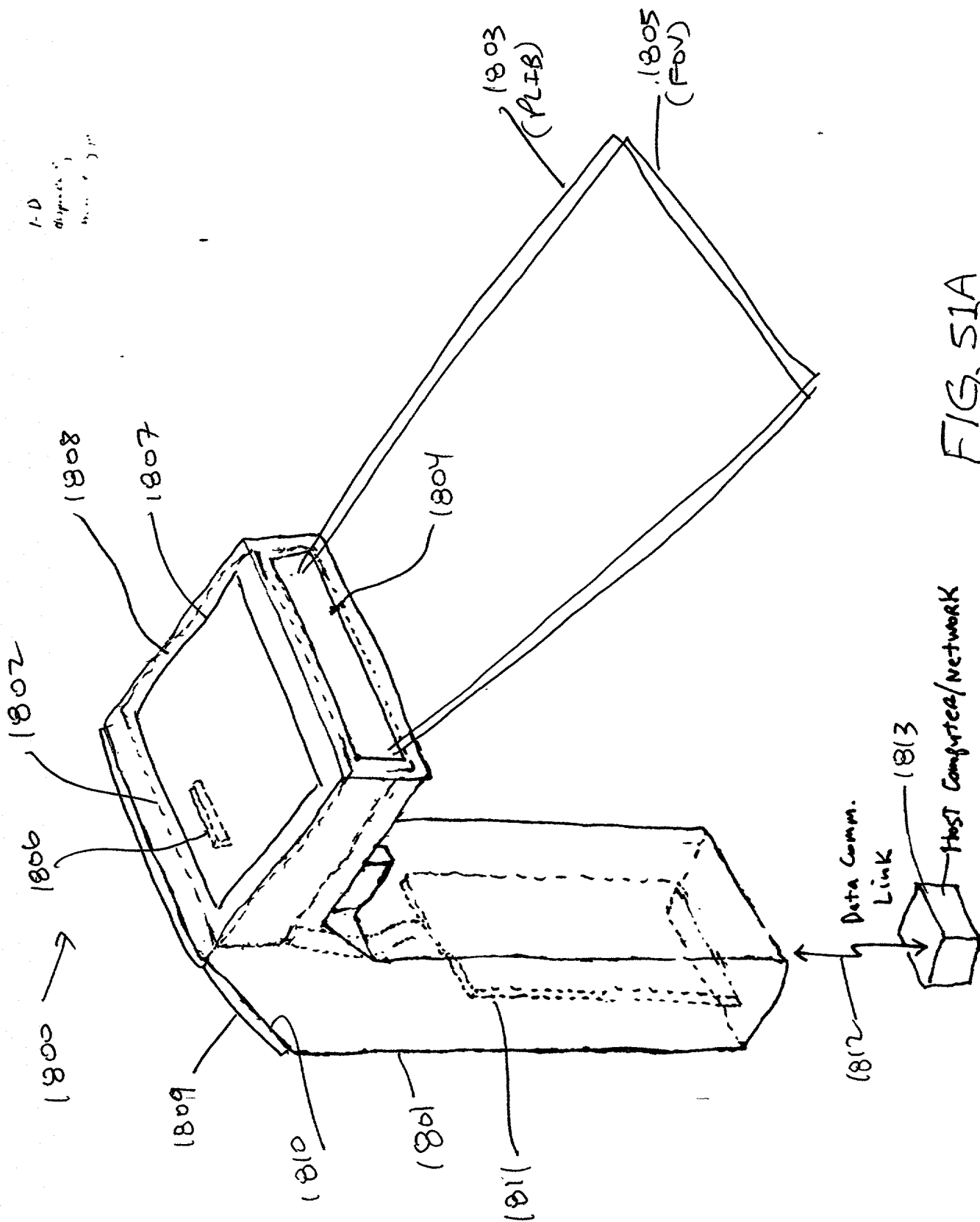


FIG. 51A

290/332

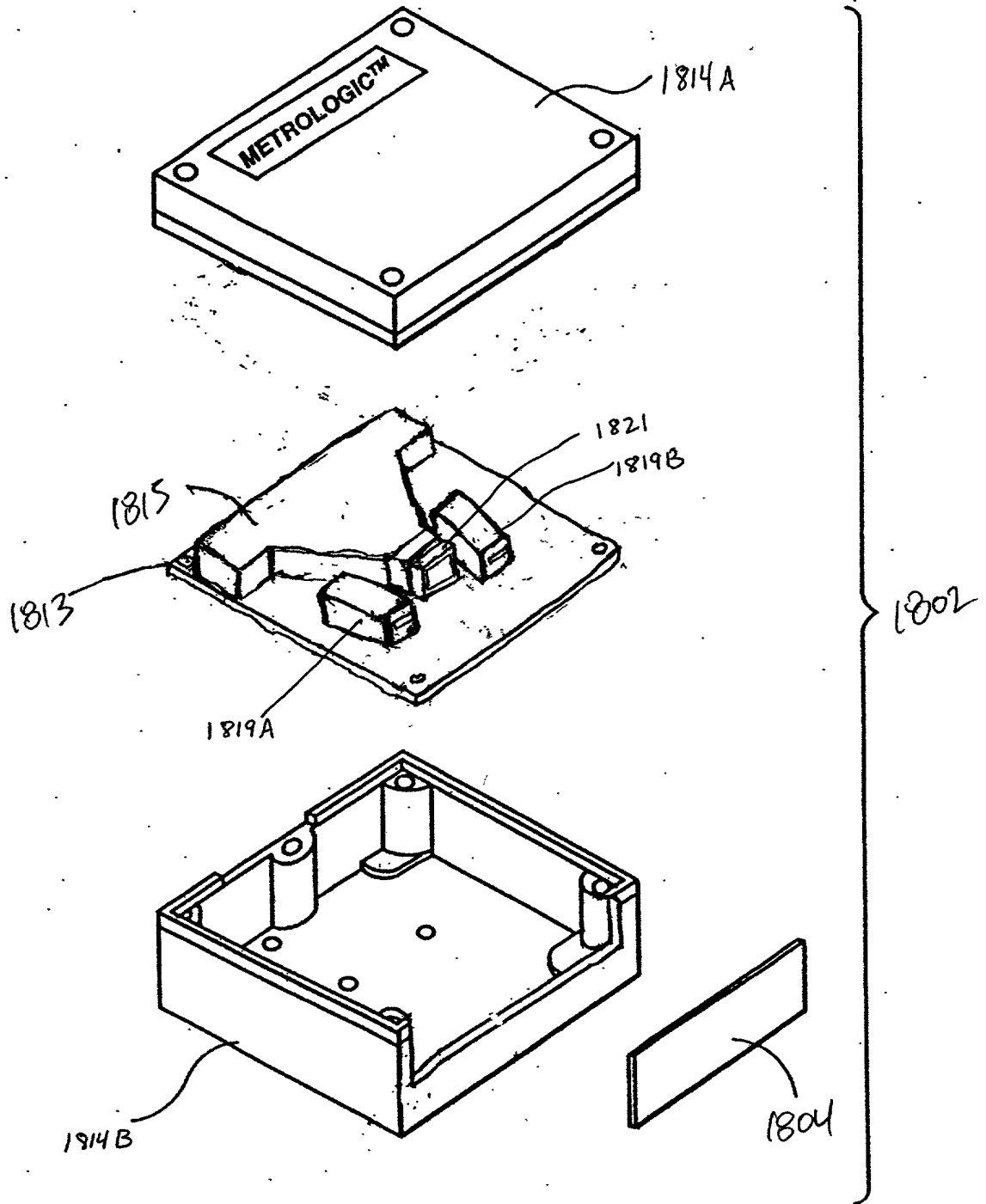
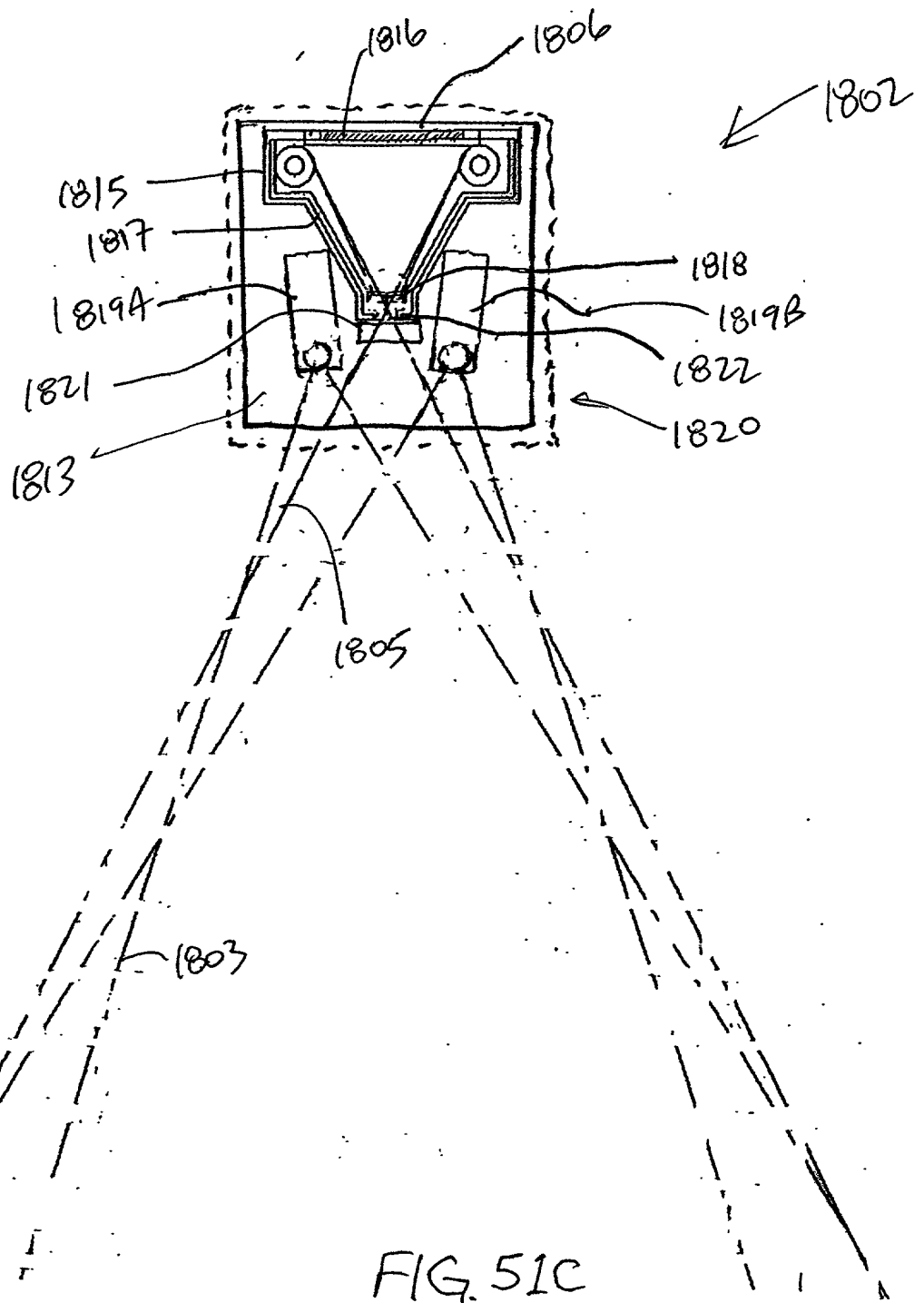


FIG. 51B

291/332



10068803-020602



FIG. 52A

293/332

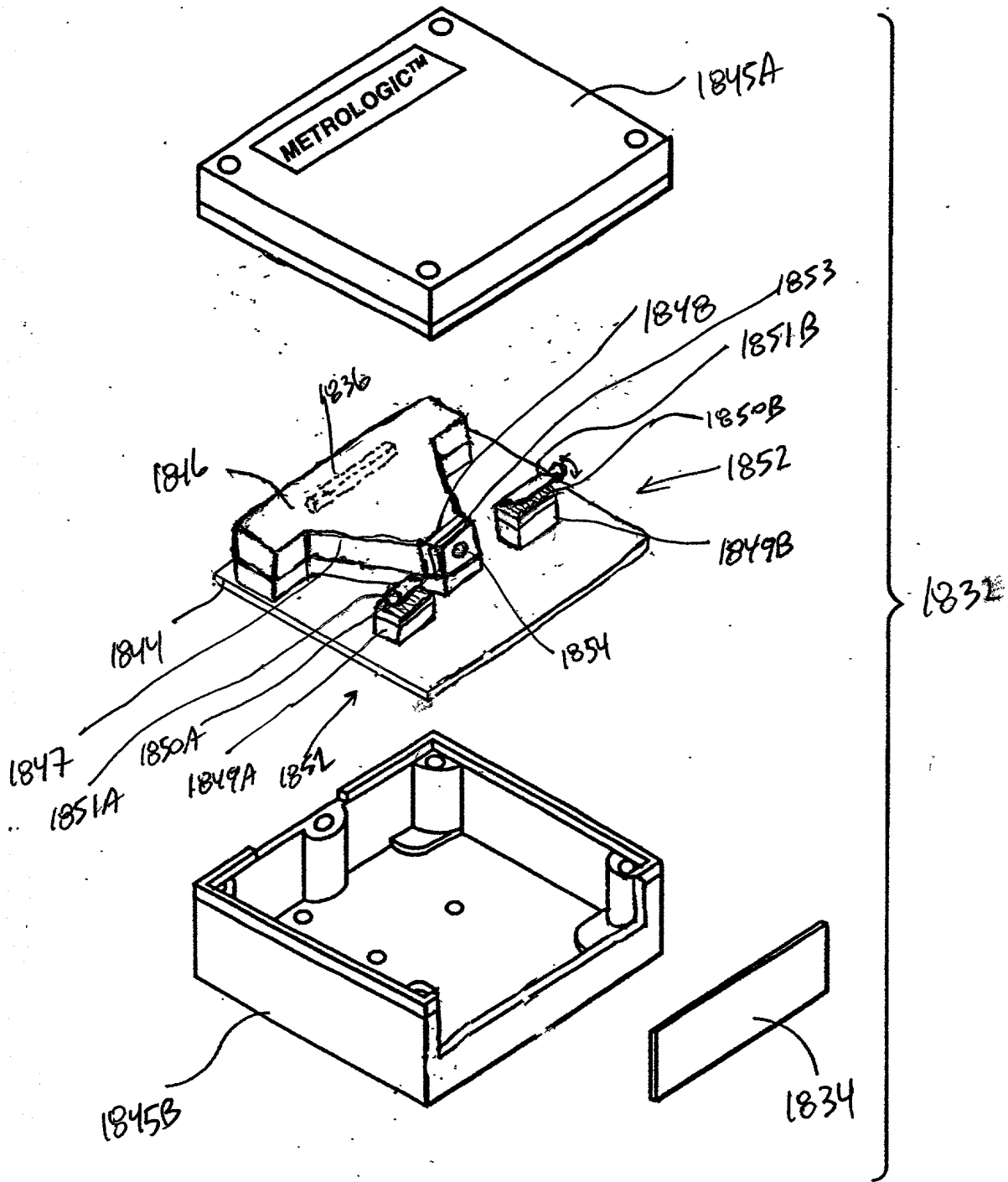


FIG. 52B

Fig. 1I3A-3B



294/332

1860 →

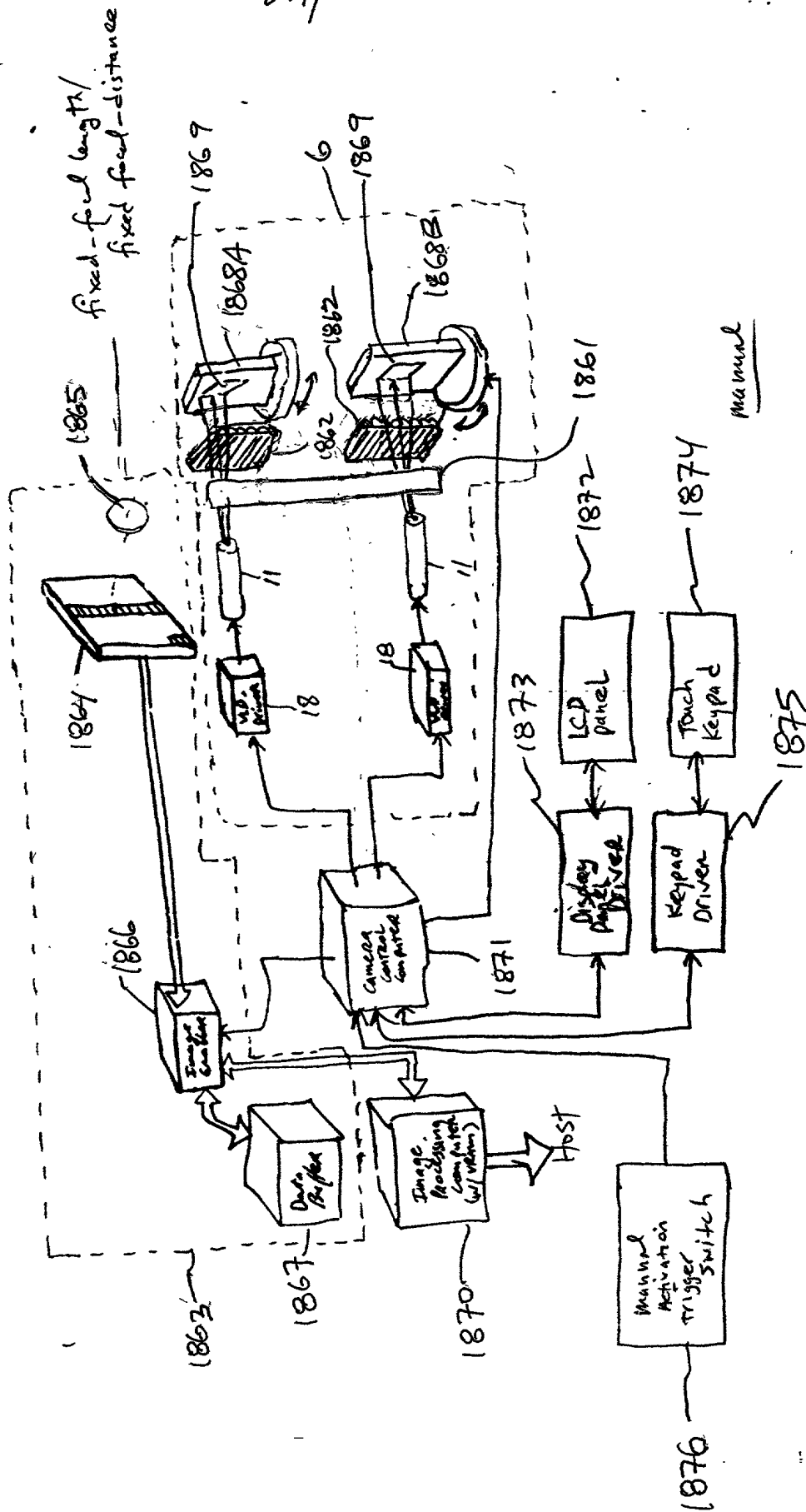
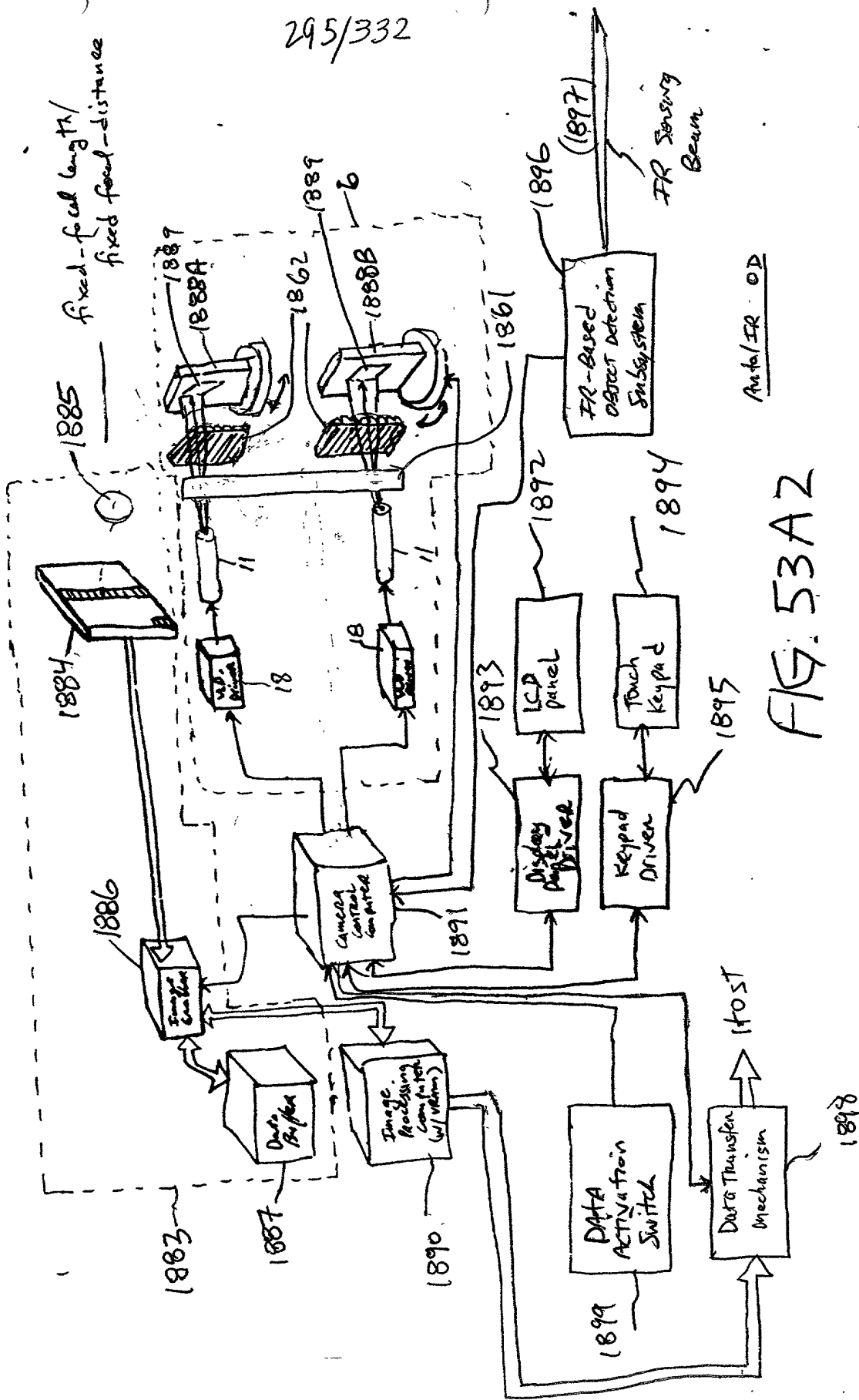


FIG. 53A1

295/332

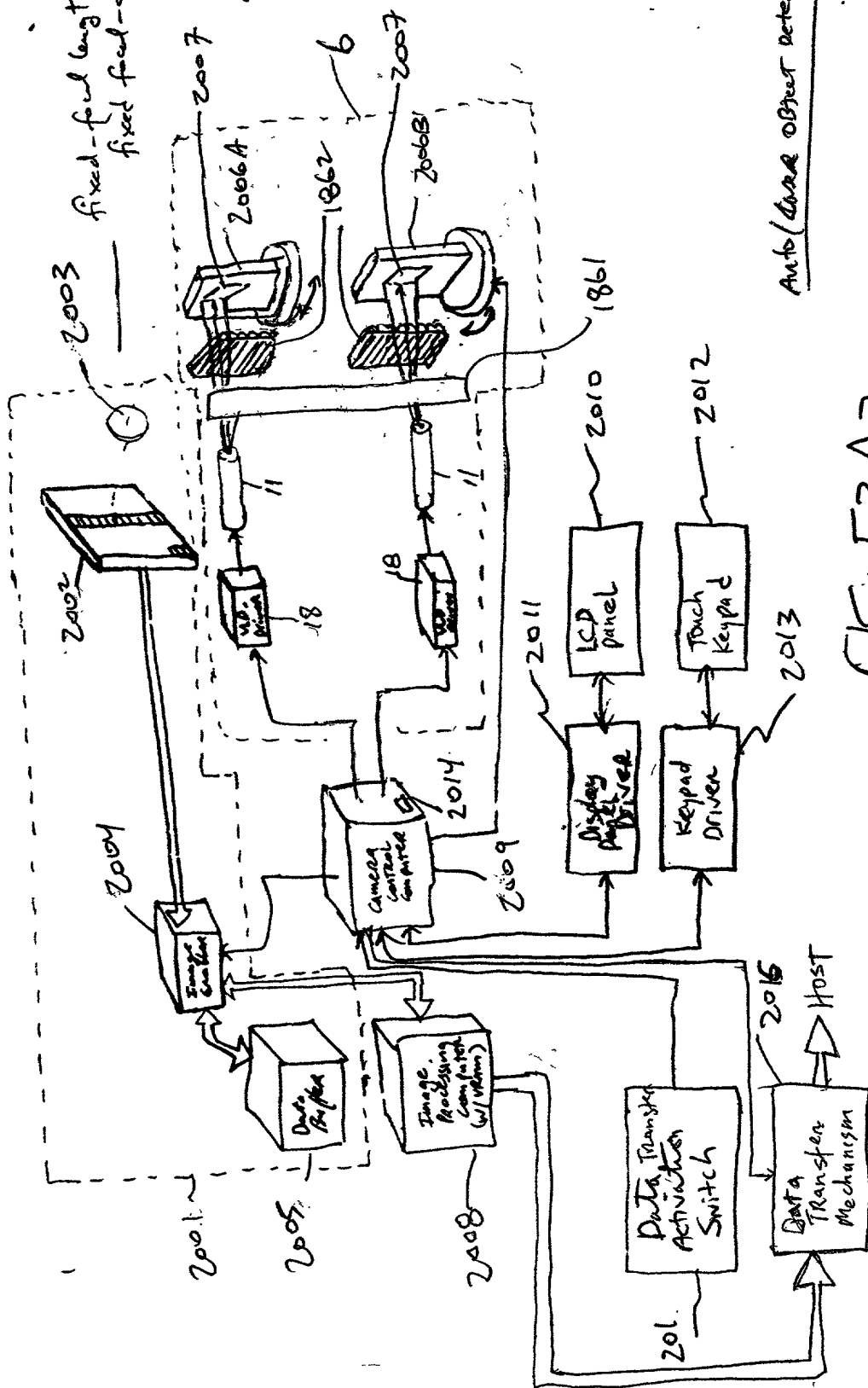
1880



Auto/IR OP

FIG. 53A2

fixed-focal length/  
fixed focal-distance

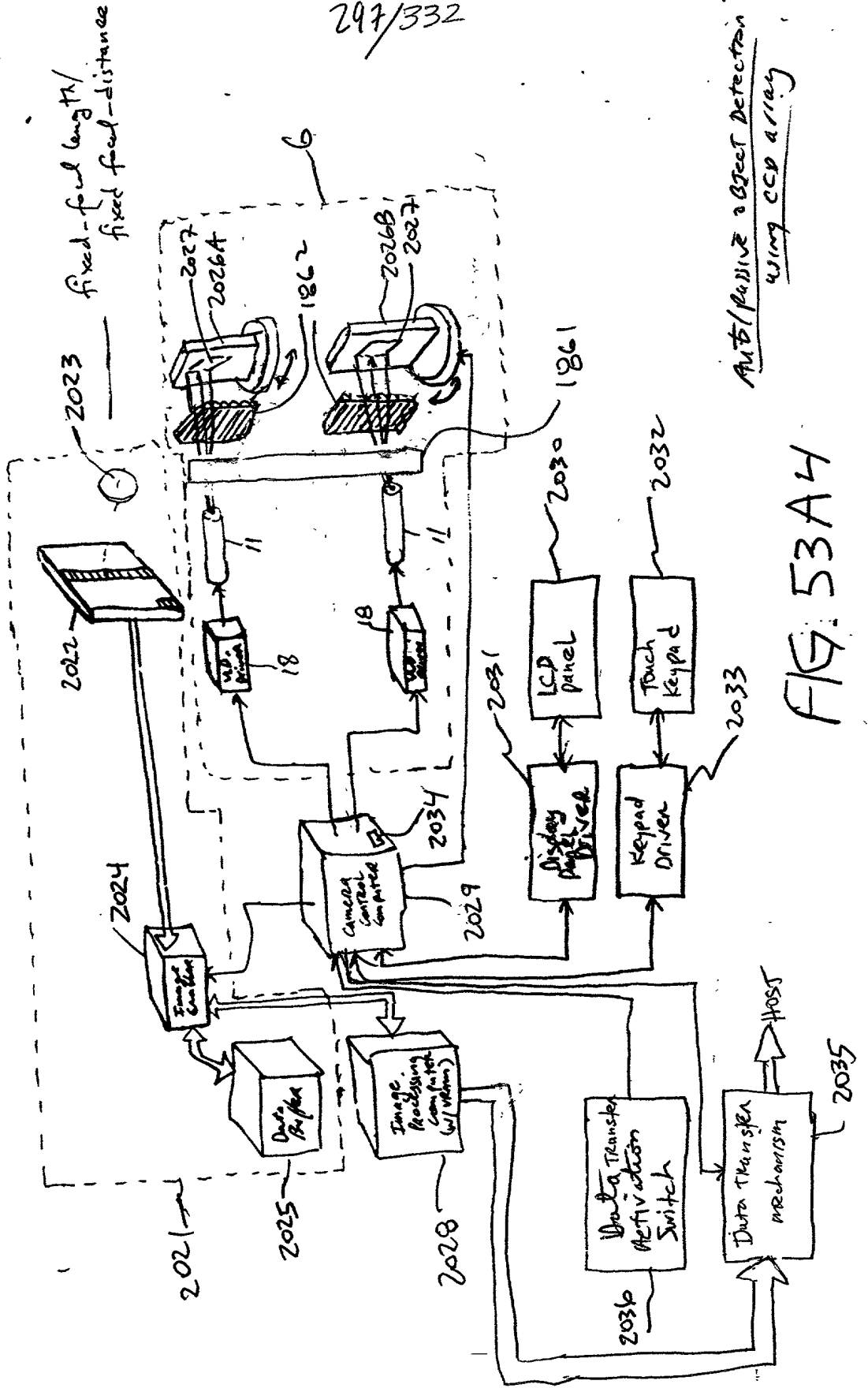


## Auto/dance object detection

FIG. 53A3

297/332

2022 →

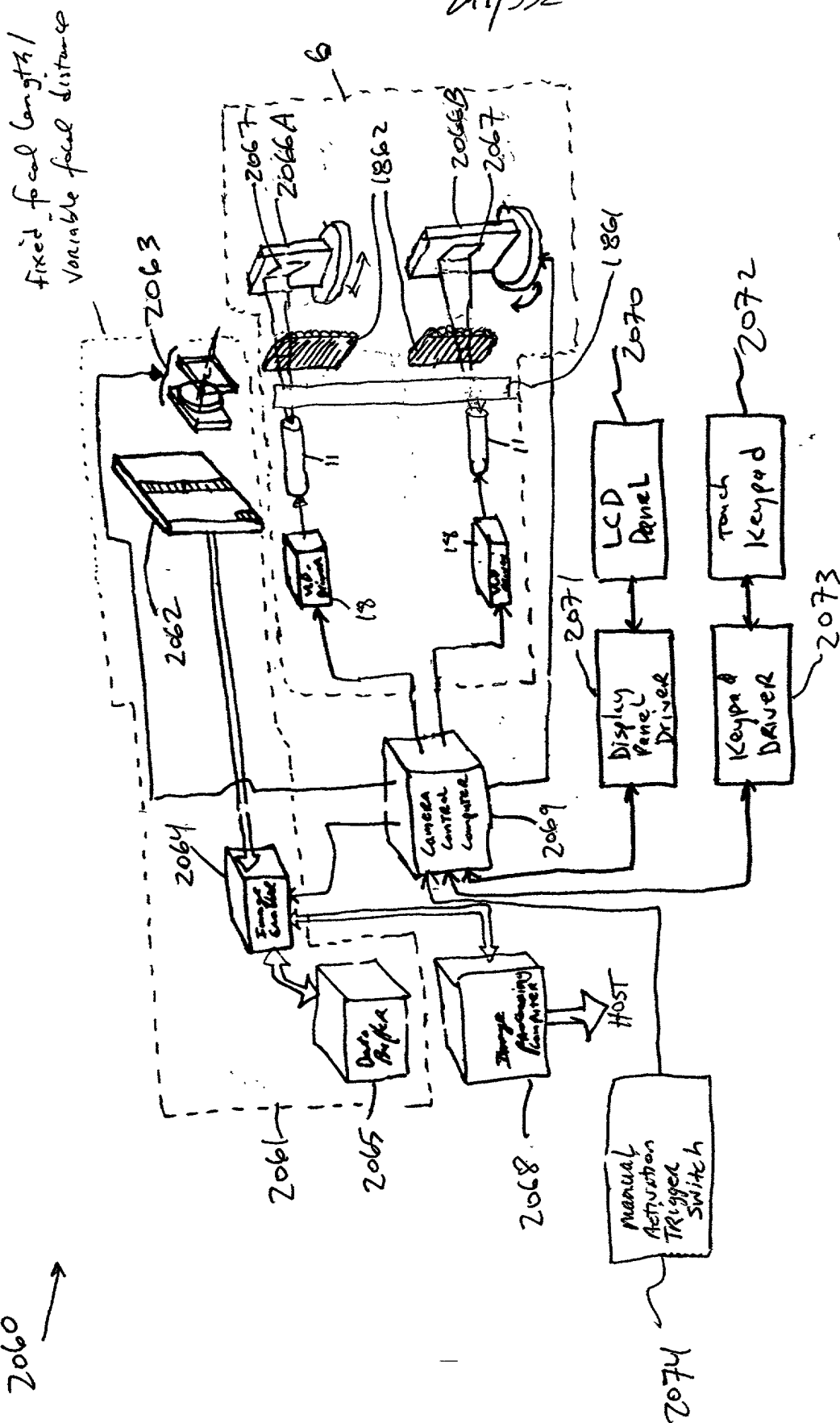


Auto/Passive Object Detection  
using CCD array



2060 

299/332



Manus

FIG. 53B1

2080

fixed focal length /  
variable focal distance

300/332

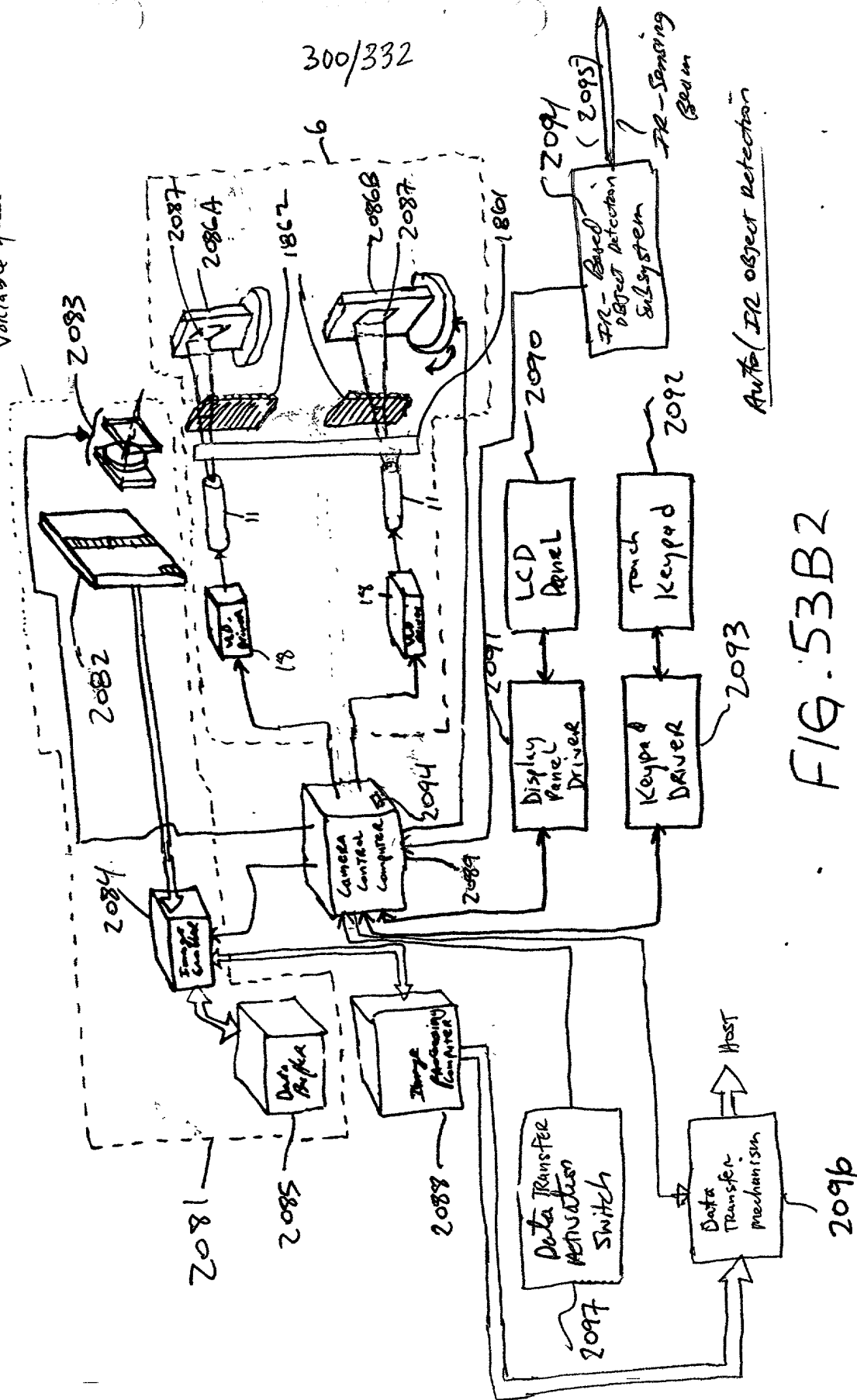


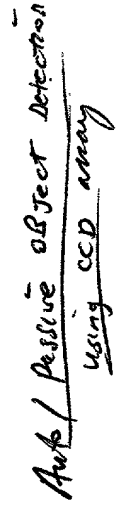
FIG. 53B2





3620 ↗

fixed focal length /  
variable focal distance



3036

← 6703

fixed focal length /  
variable focal distance

303/332

Auto / BCD only, no object detection

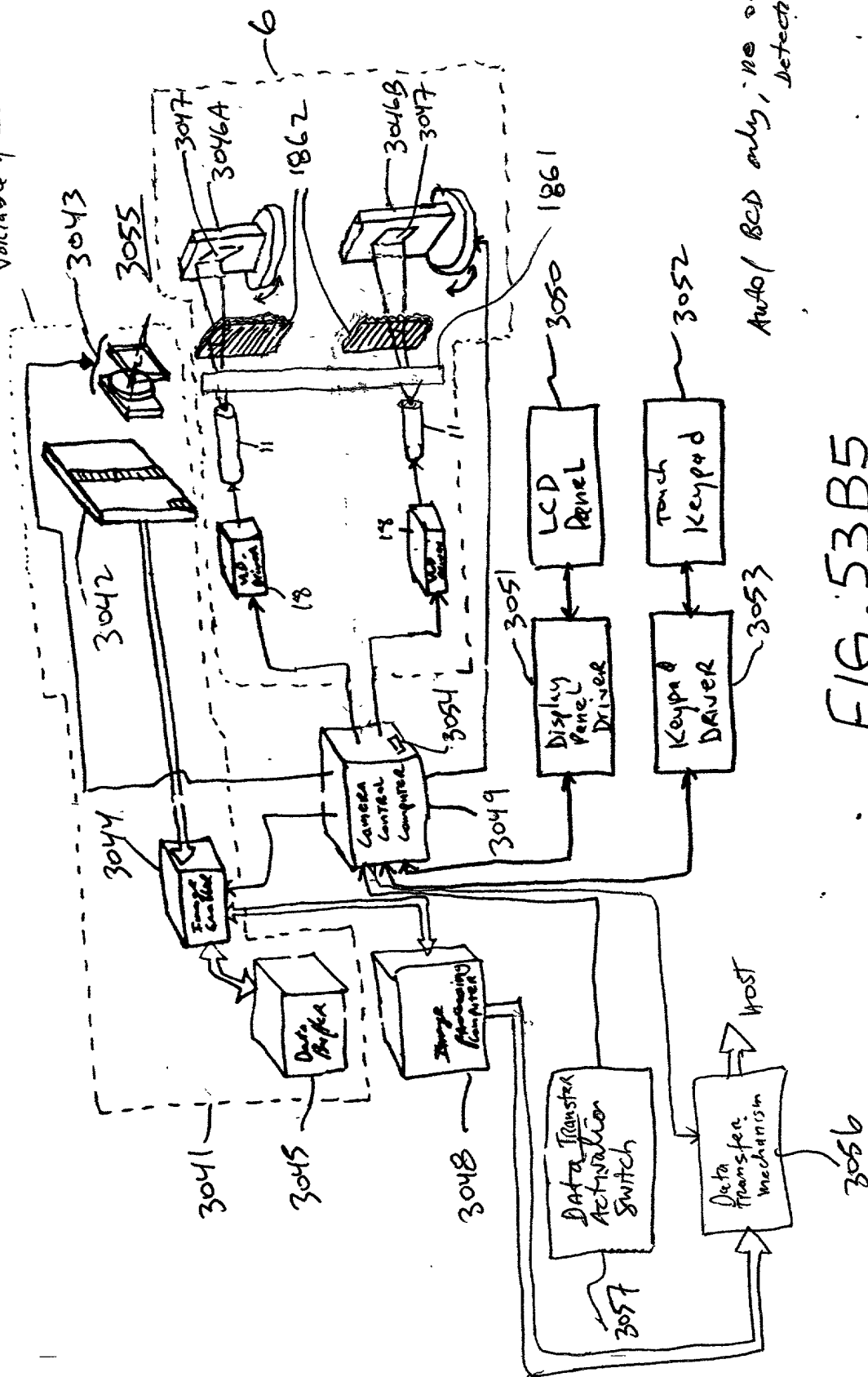
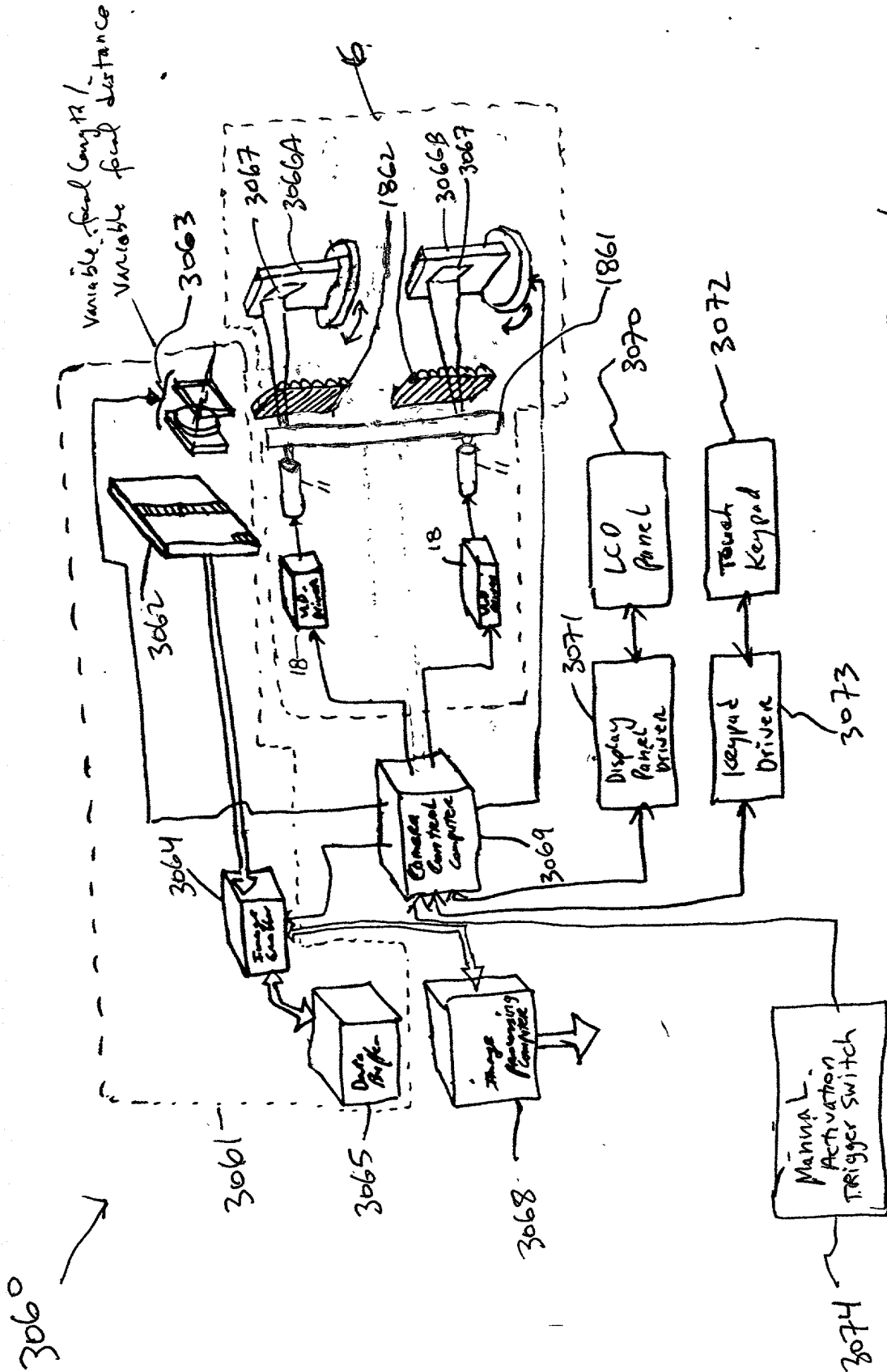


FIG. 53B5

304/332

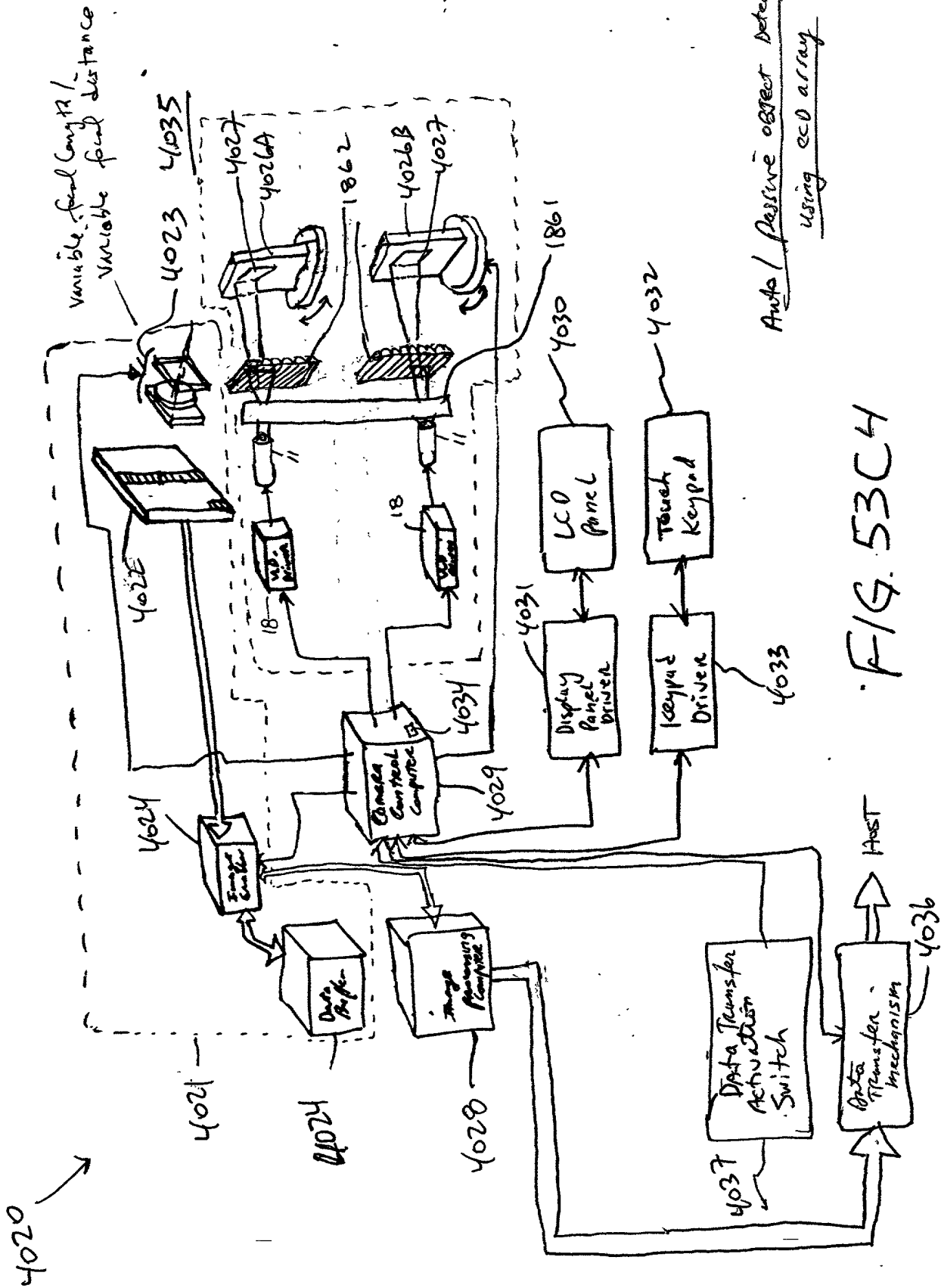


Manual

FIG. 53C1







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308/332

Auto (BCD only), no object detection

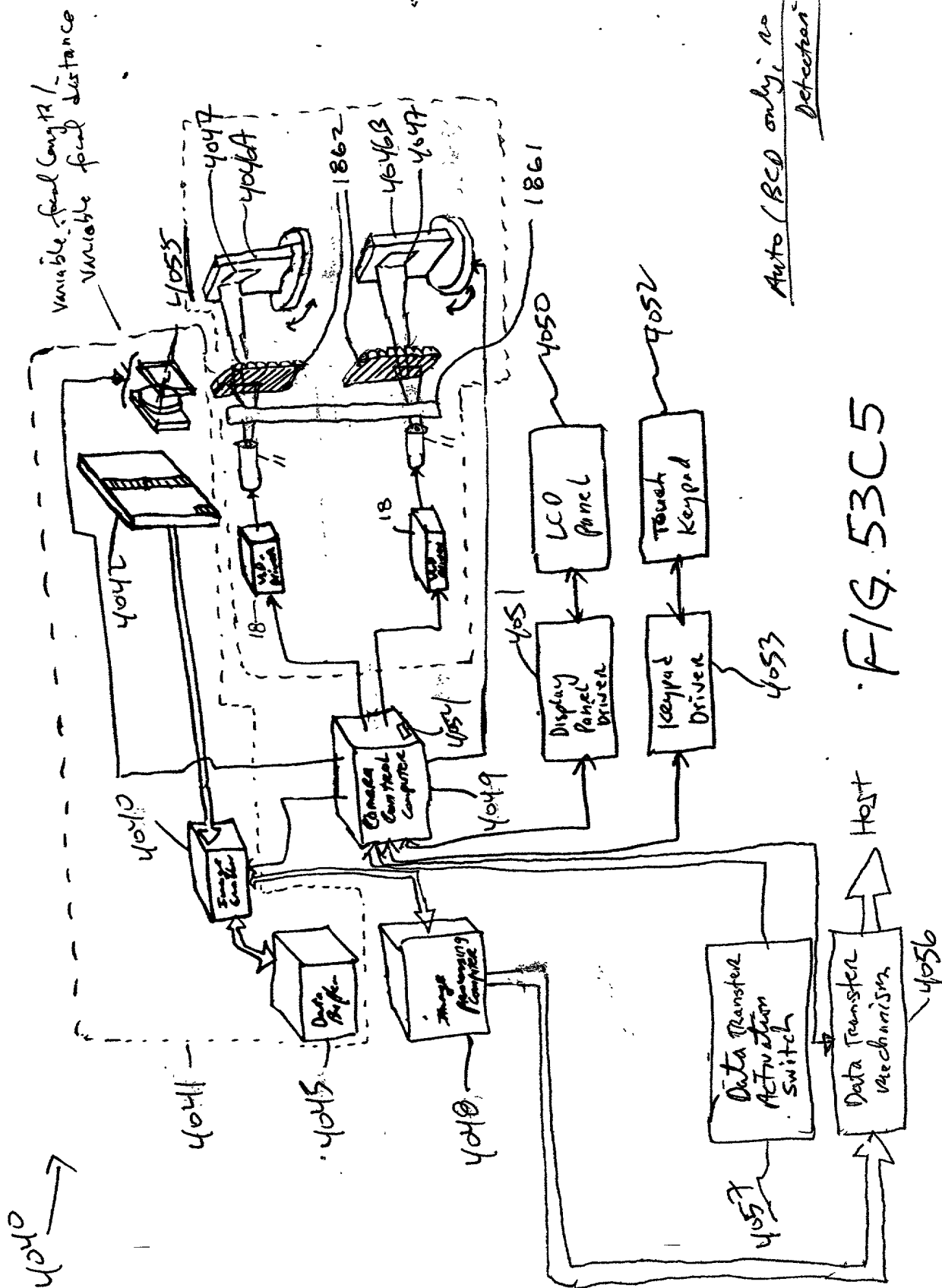


FIG. 53C5

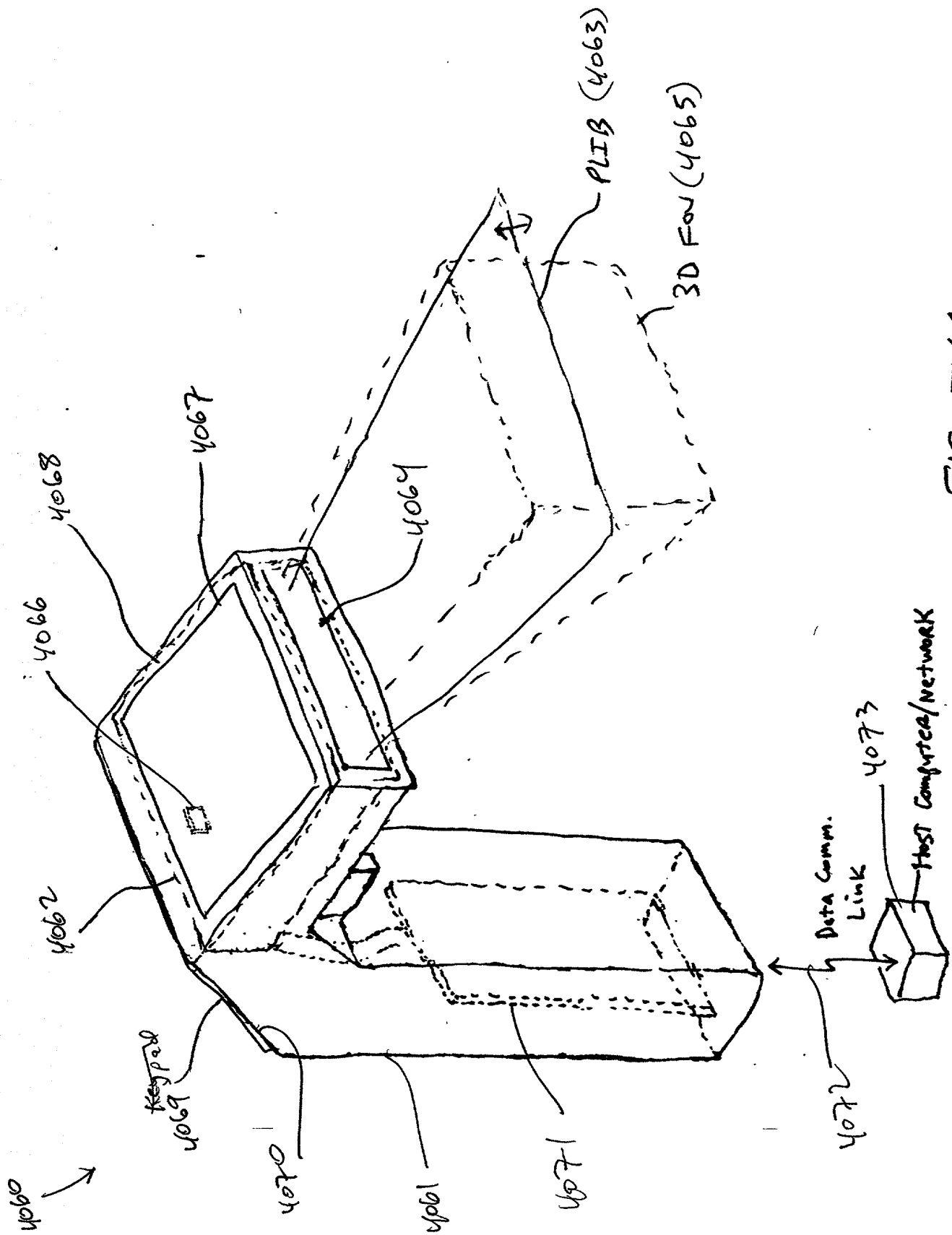


FIG. 54A



310/332

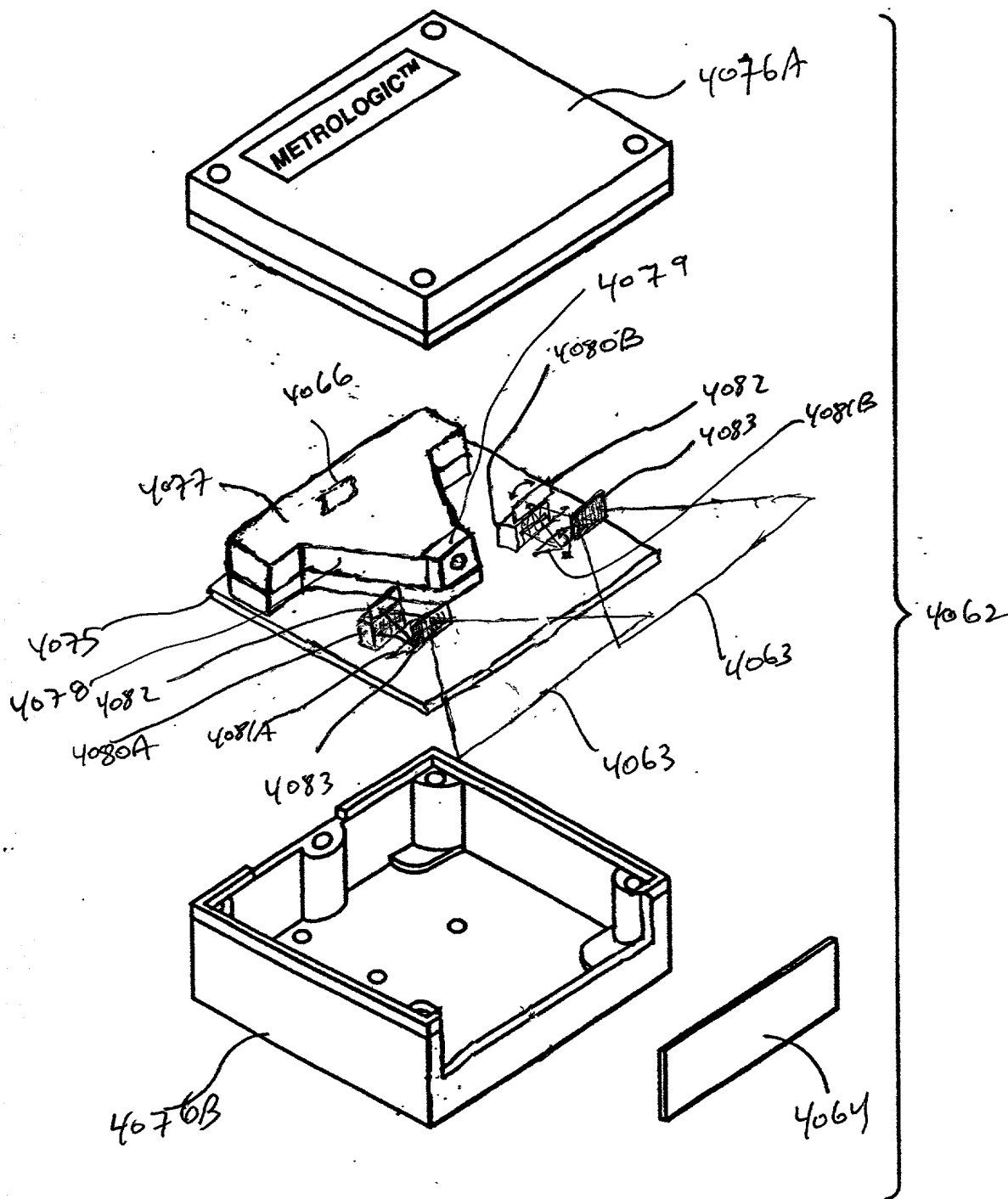


FIG. 54B

(Dual mirrors)

Fig. 175A-SP1



312/332

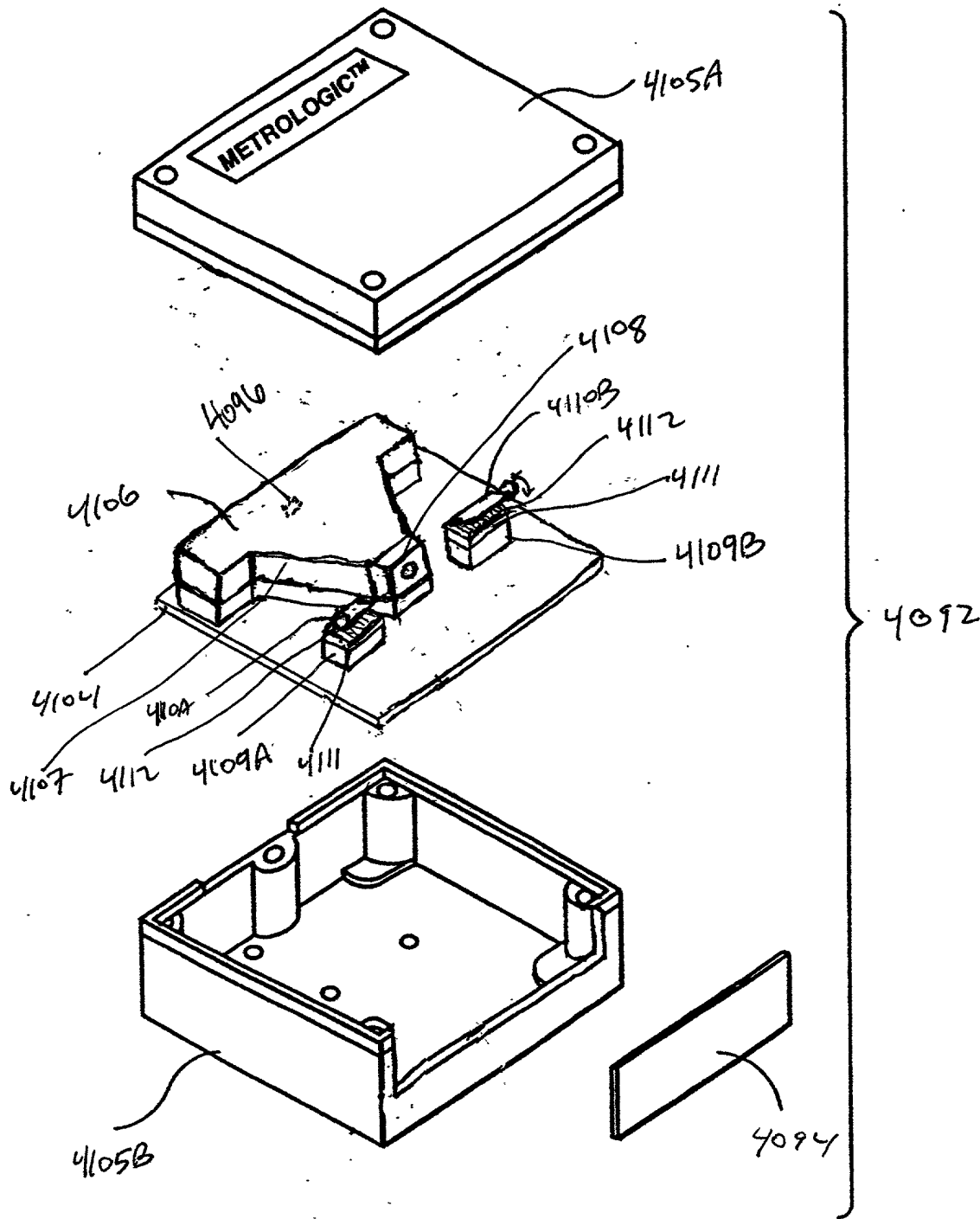


FIG. 55B

Brogs cell  
Fig 126A-6B

209020-20889001



314/332

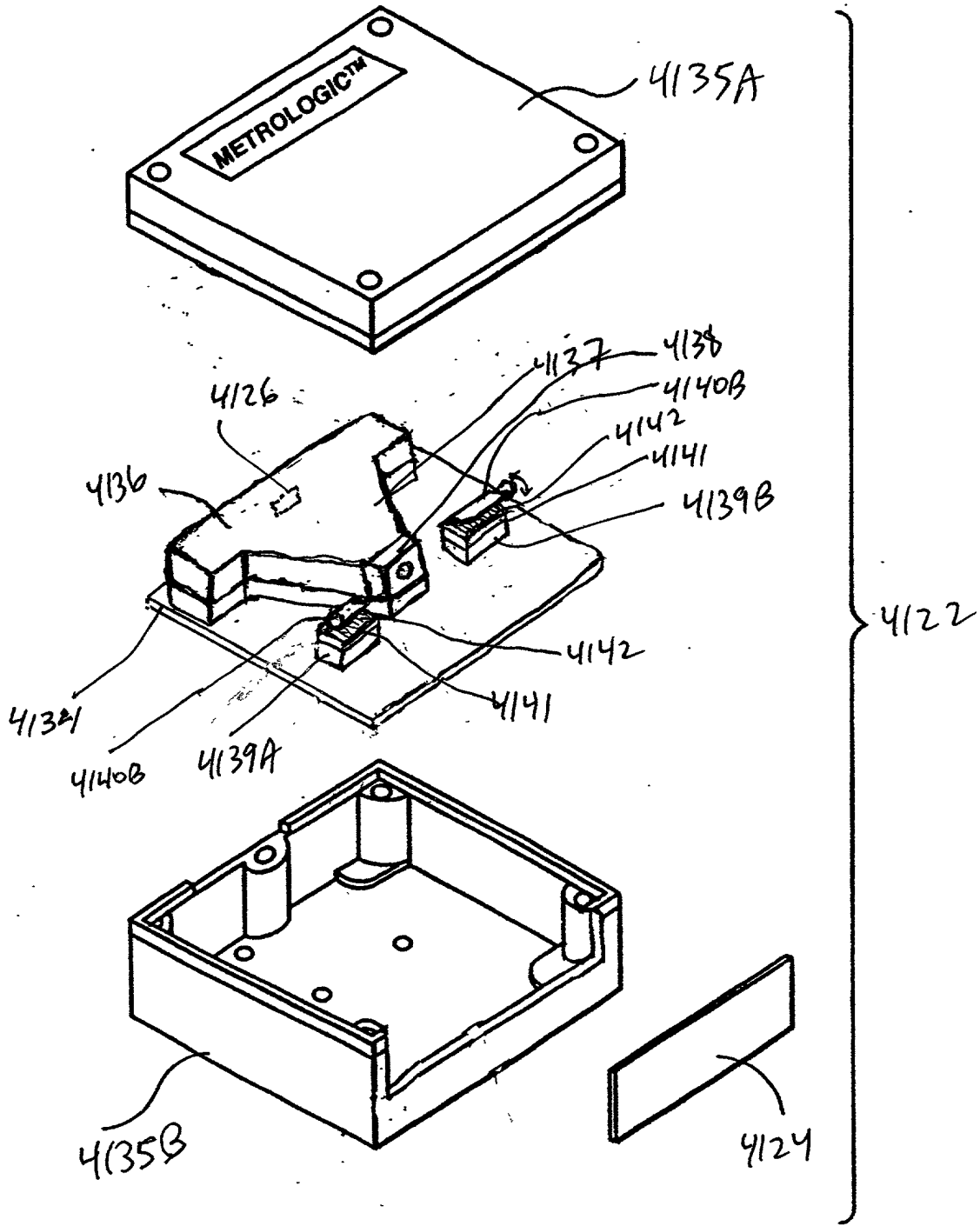


FIG. 56B

DM

Fig. 1A-7C

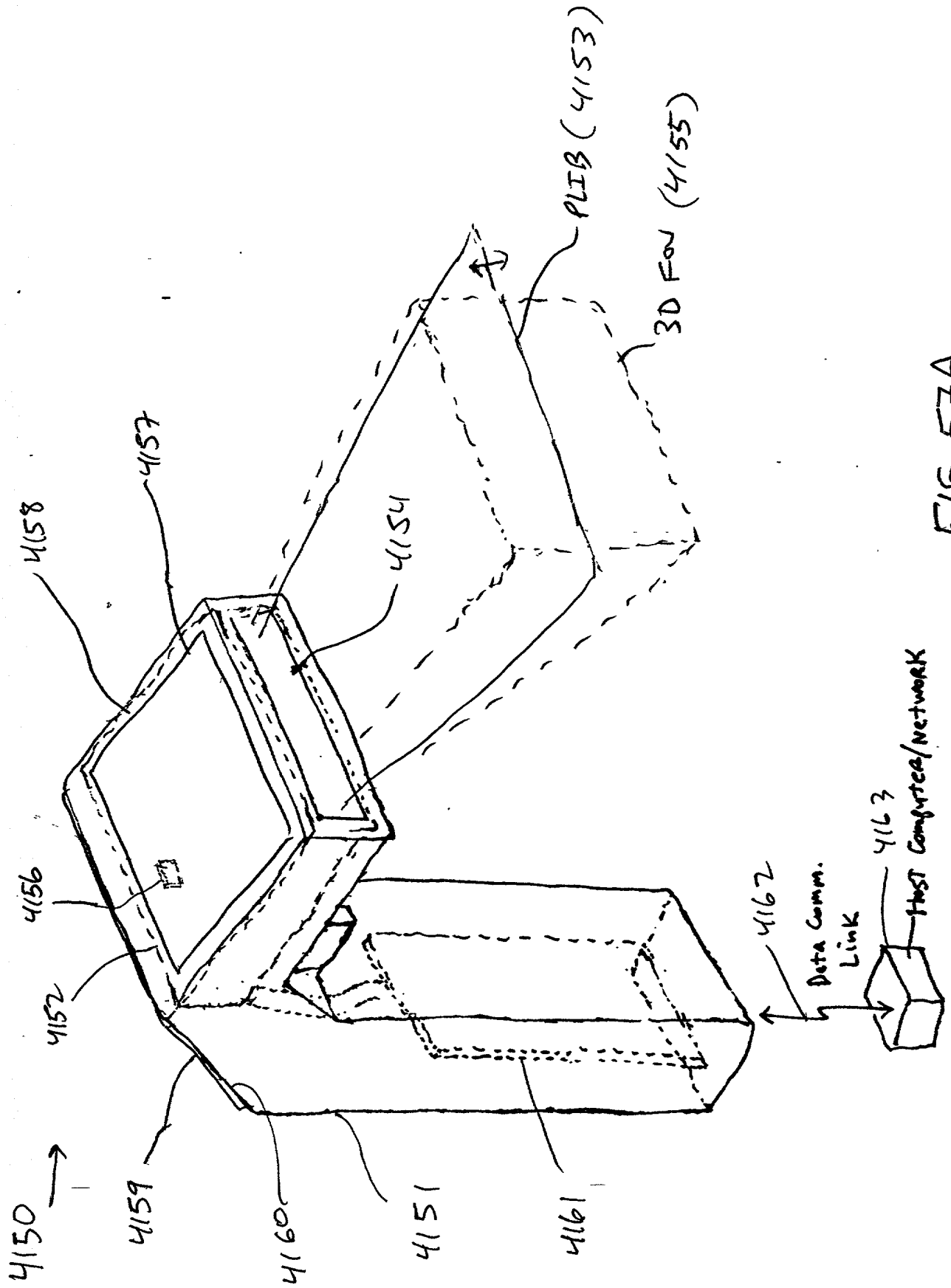


FIG. 57A

36/332

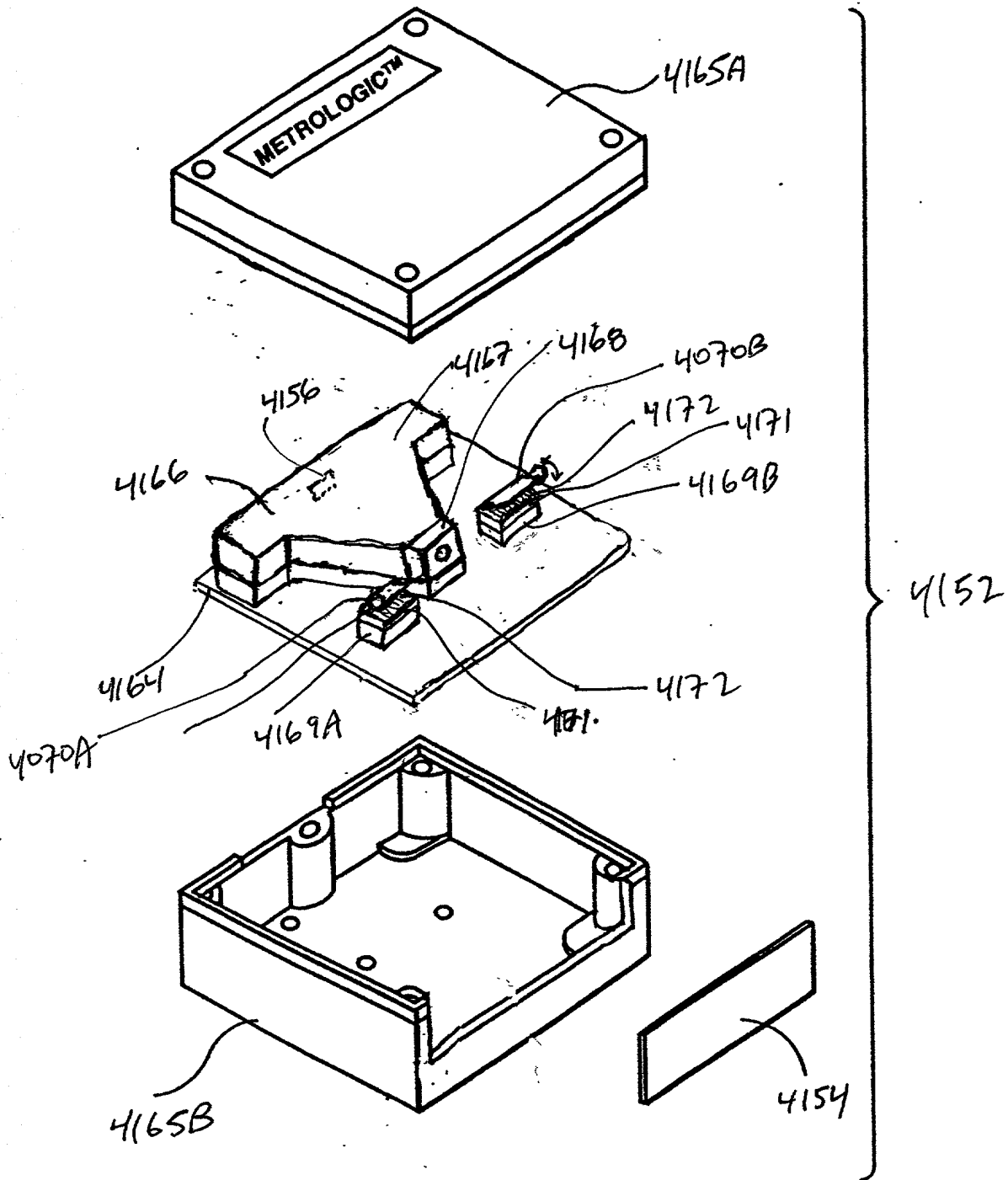


FIG. 57B

Phase only LCR  
PM panel

Fig 178F-86

10068803.020602

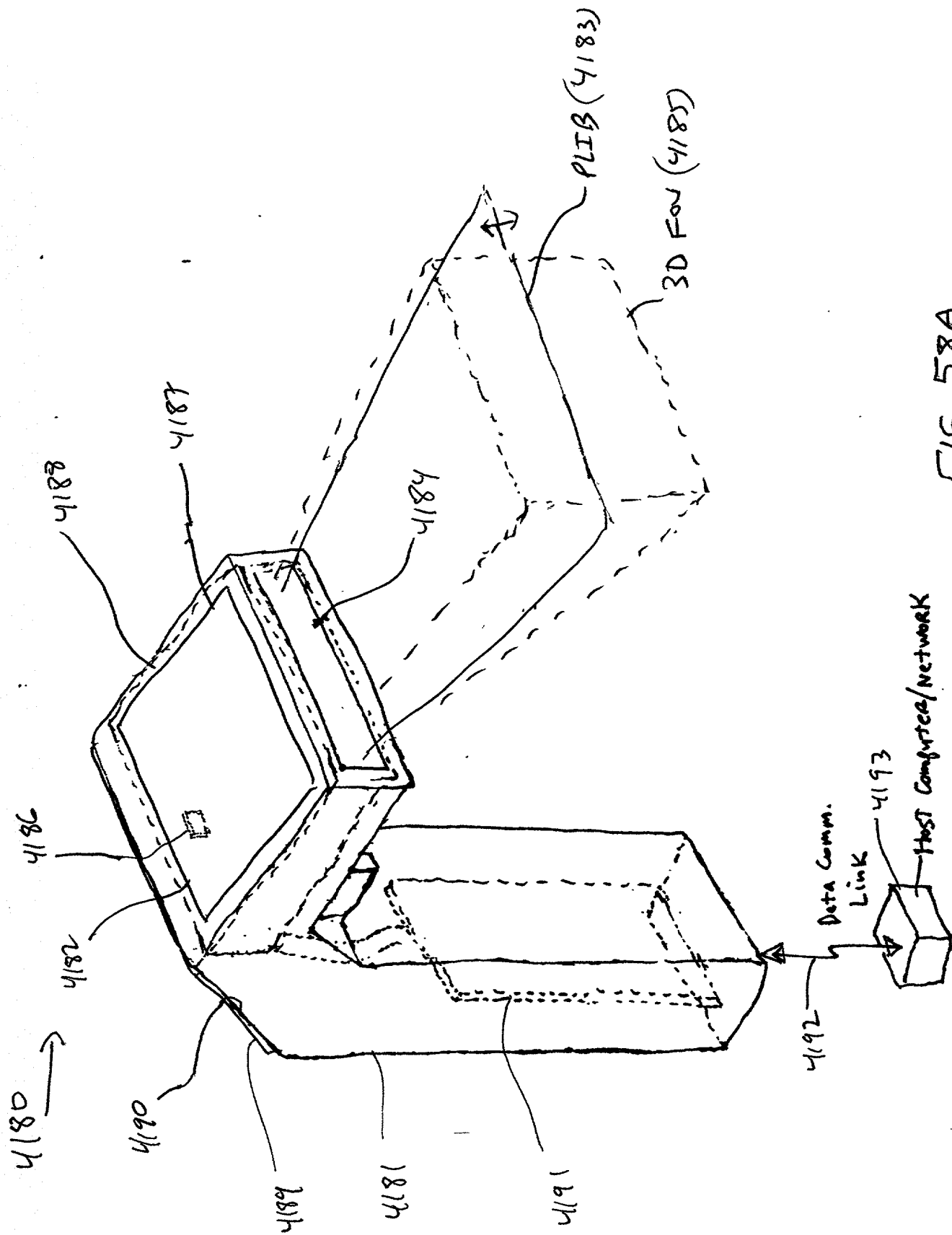


FIG. 58A



318/332

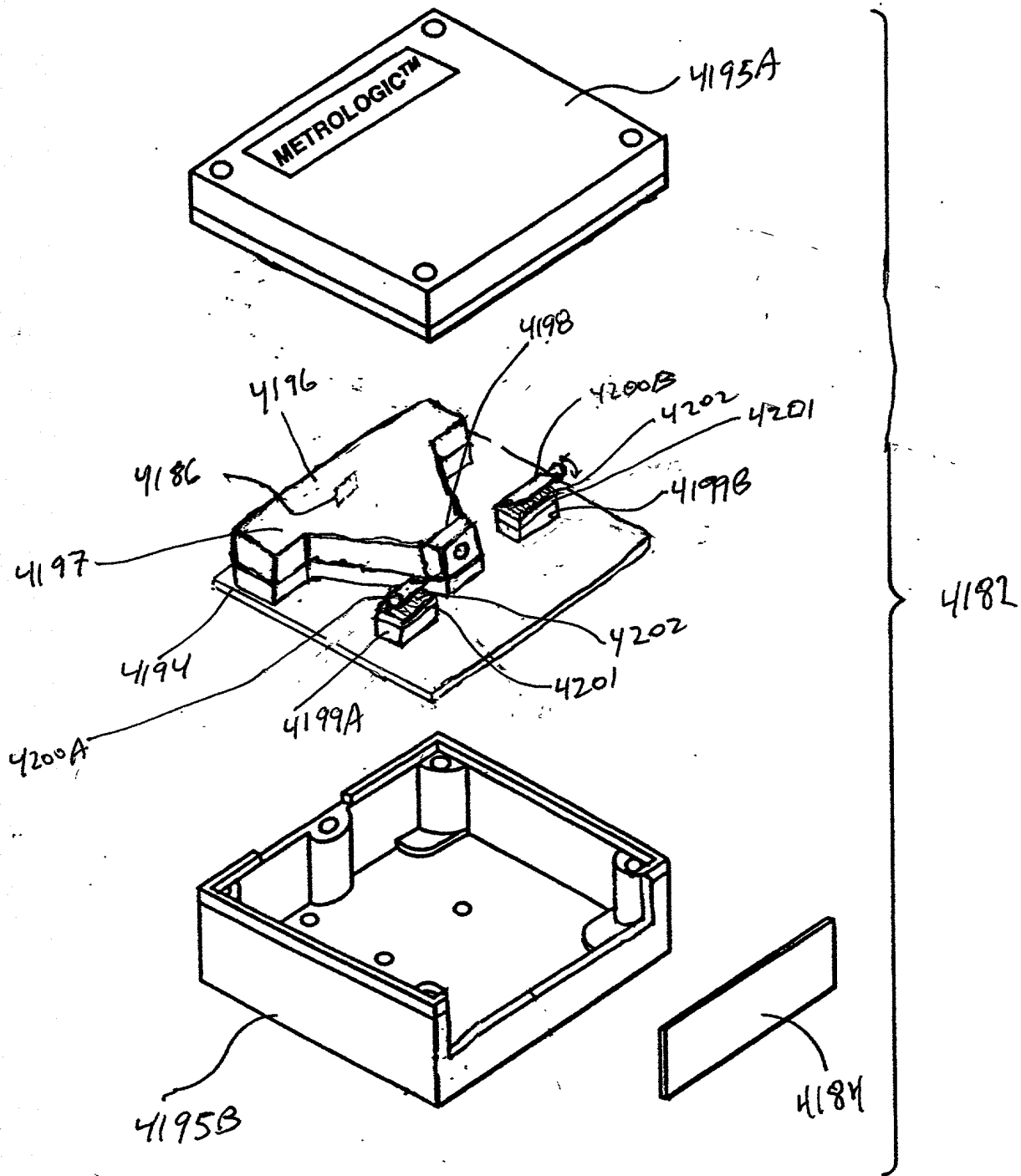


FIG. 58B

HS optical shutter

Fig. 1F14A-14B

20090210" E08389001

319/332

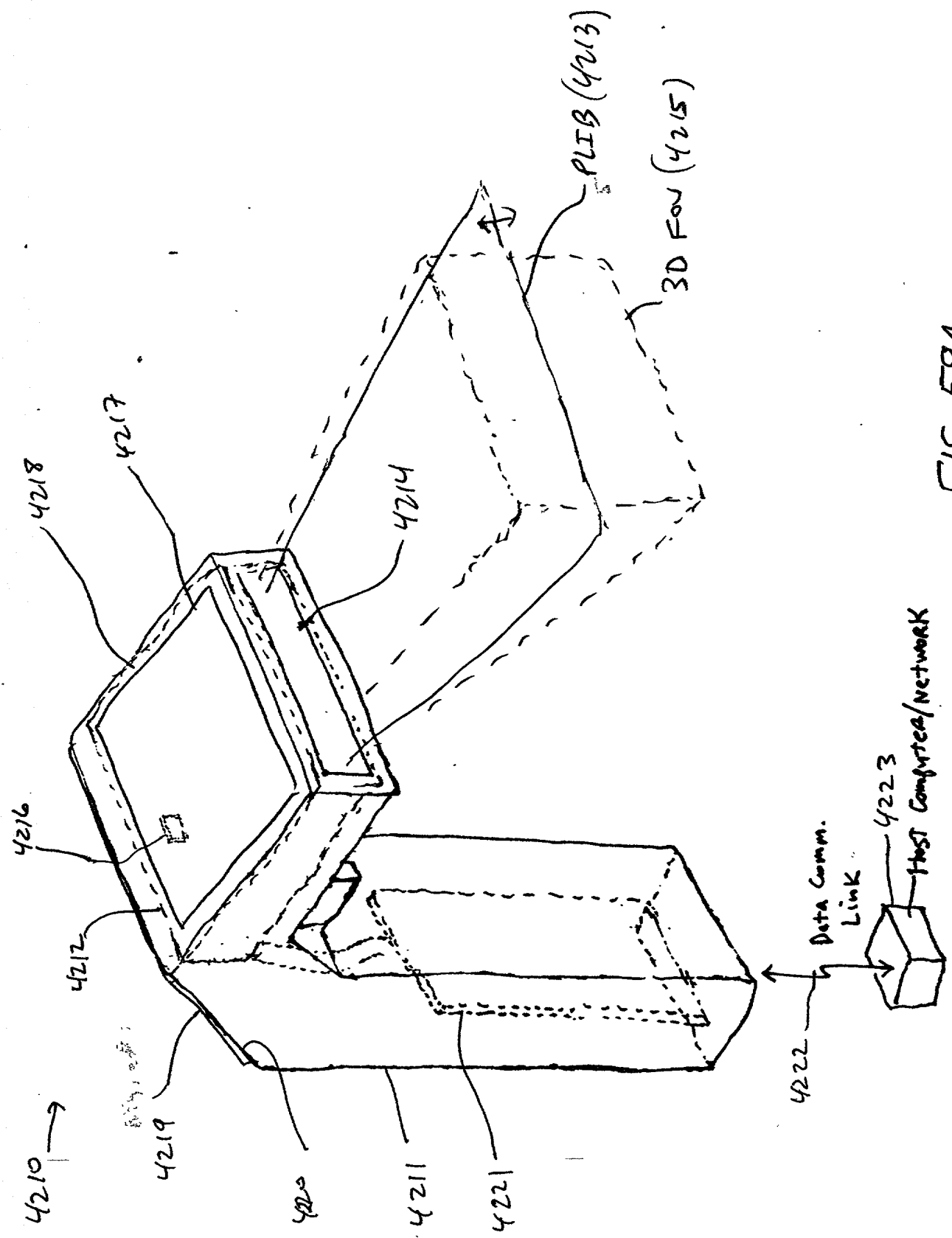


FIG. 59A

2009020-2009000T

320/332

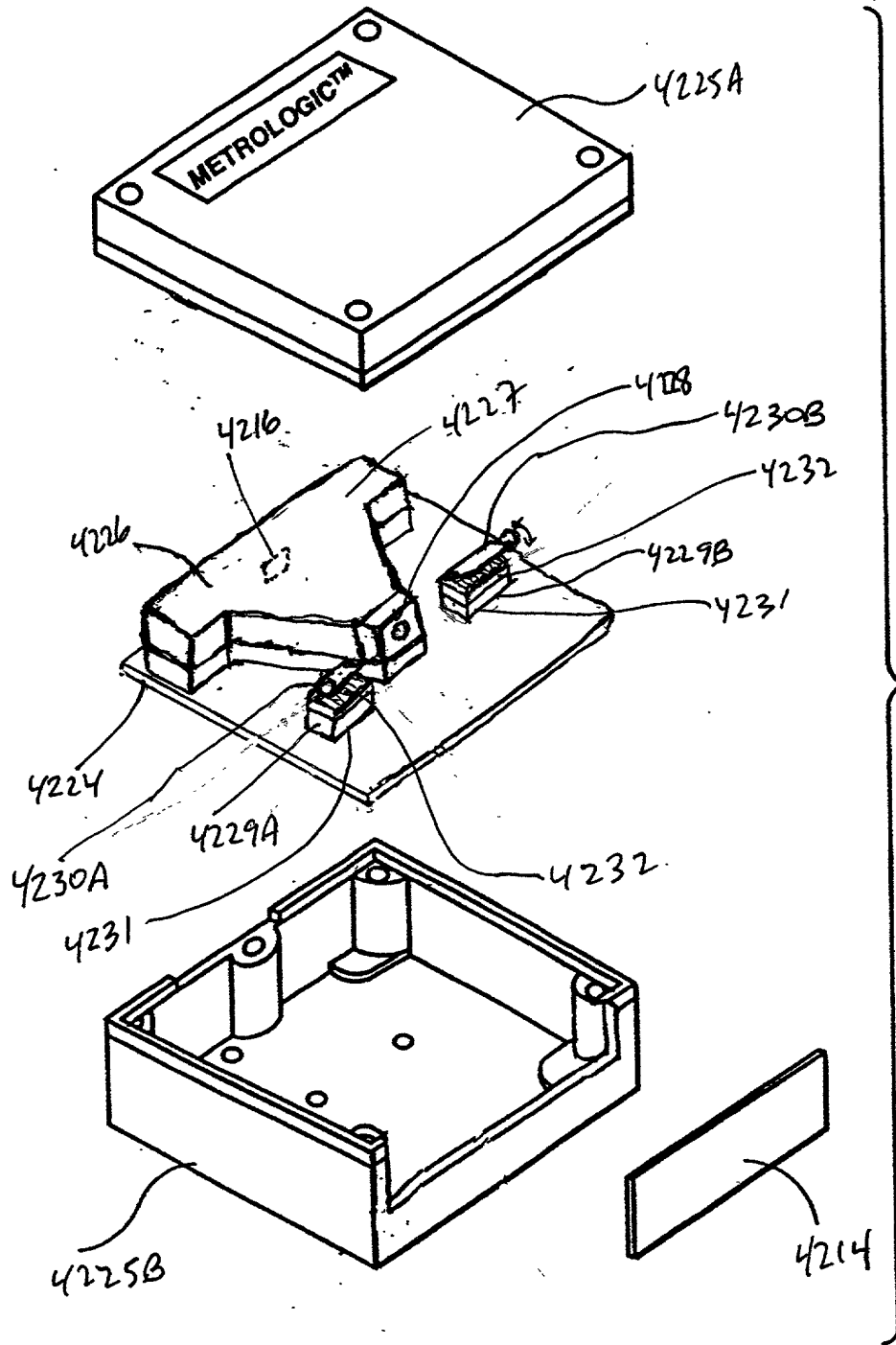


FIG. 59B

INCLD.  
Fig. 15A-15B



10058803-020607

322/332

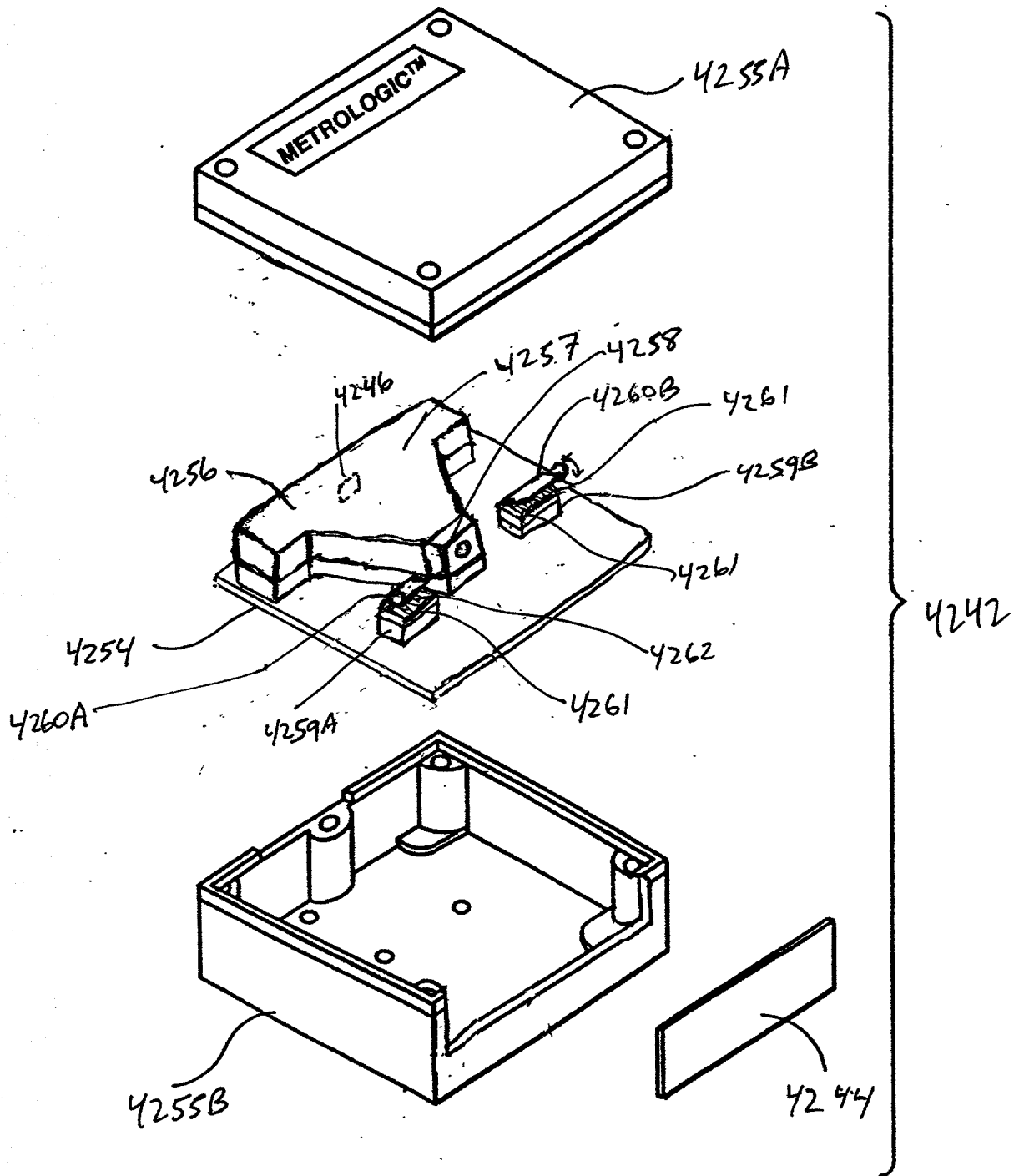


FIG. 60B

Bthalon (Temp. phase mod.)  
Fig. 117A-17B

2090210" E088900T

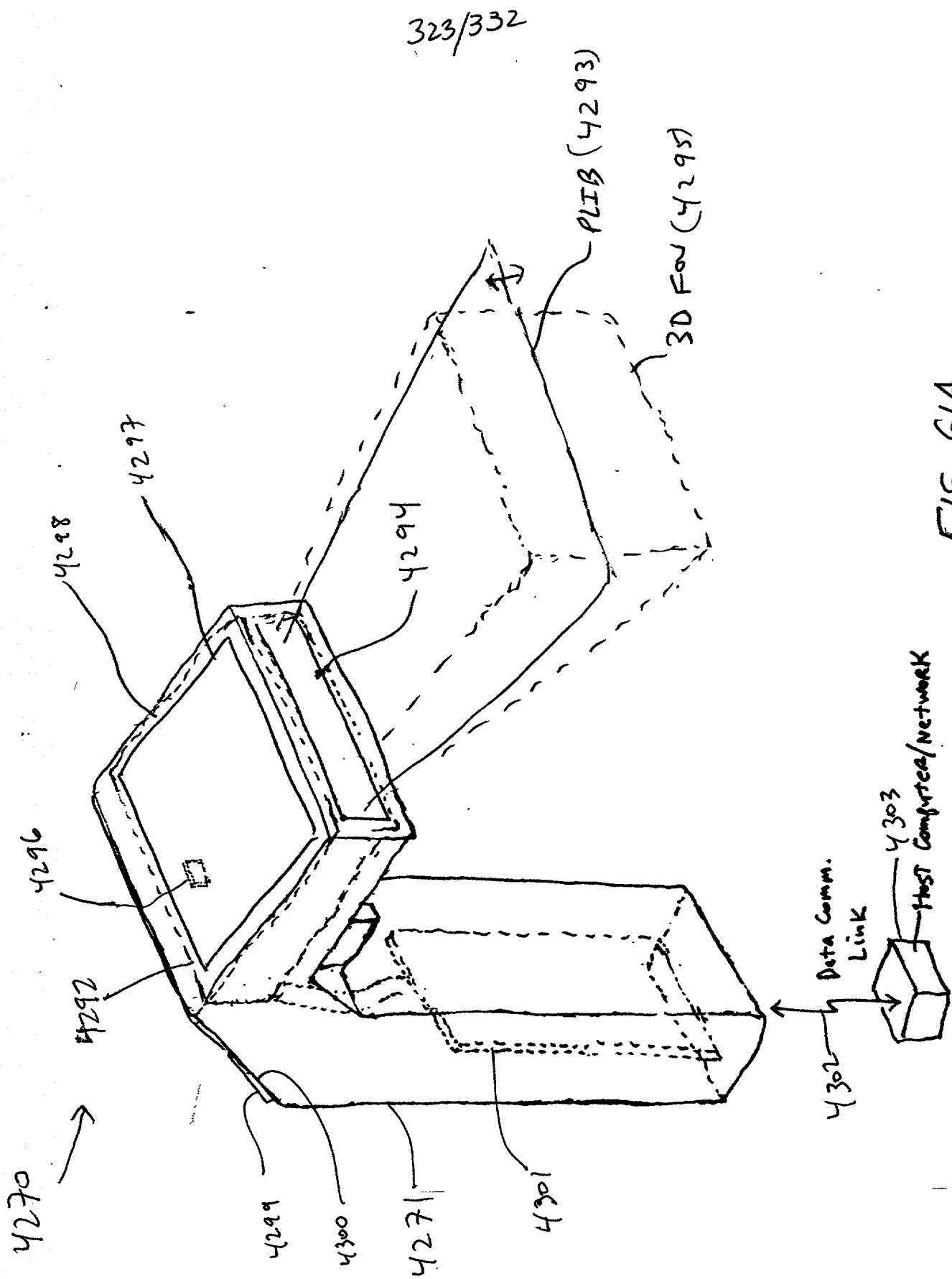


FIG. 6/A

324/332

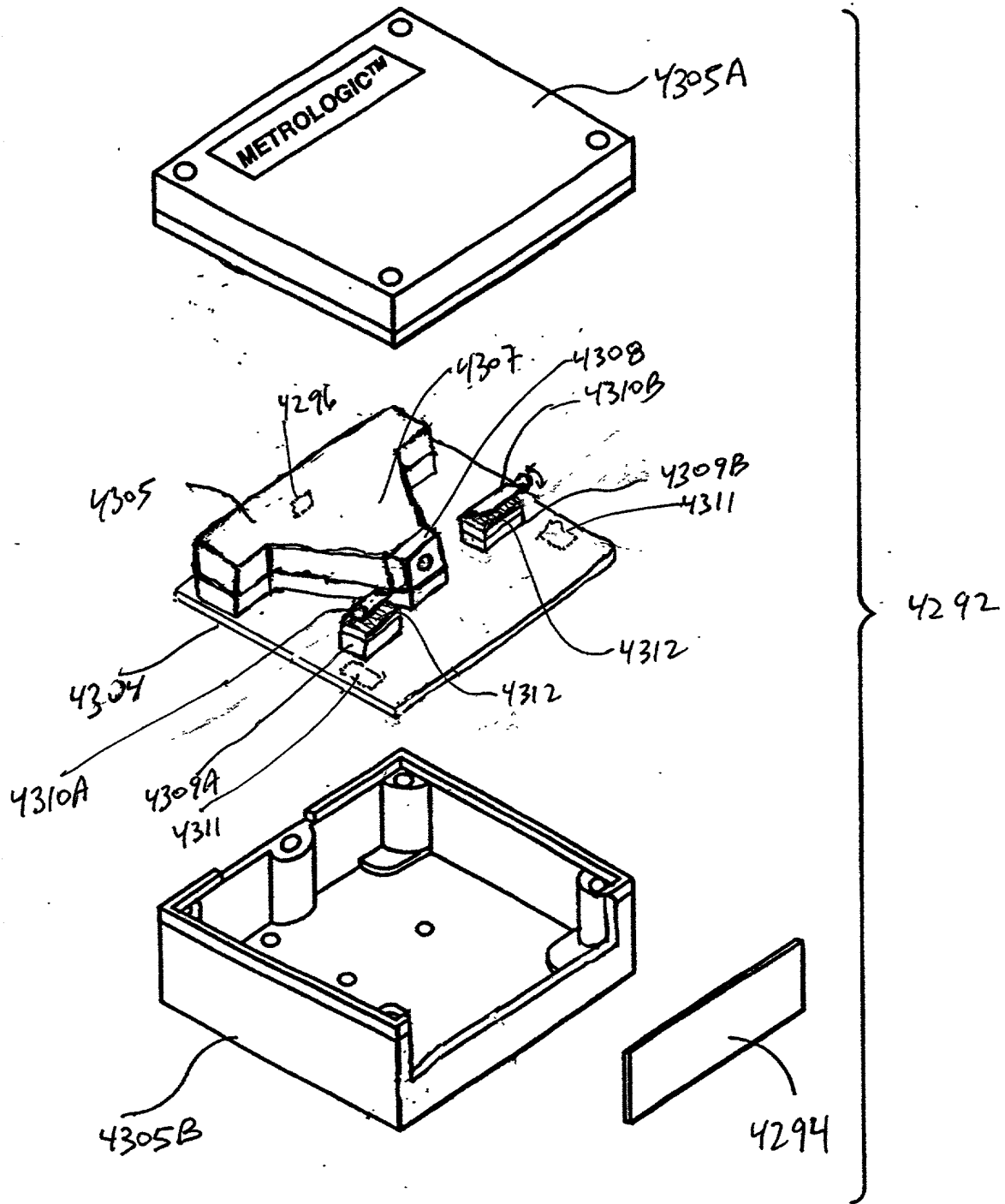


FIG. 61B

mod. hugging

Fig. 1A-19B

2099020" E0889001

325/332

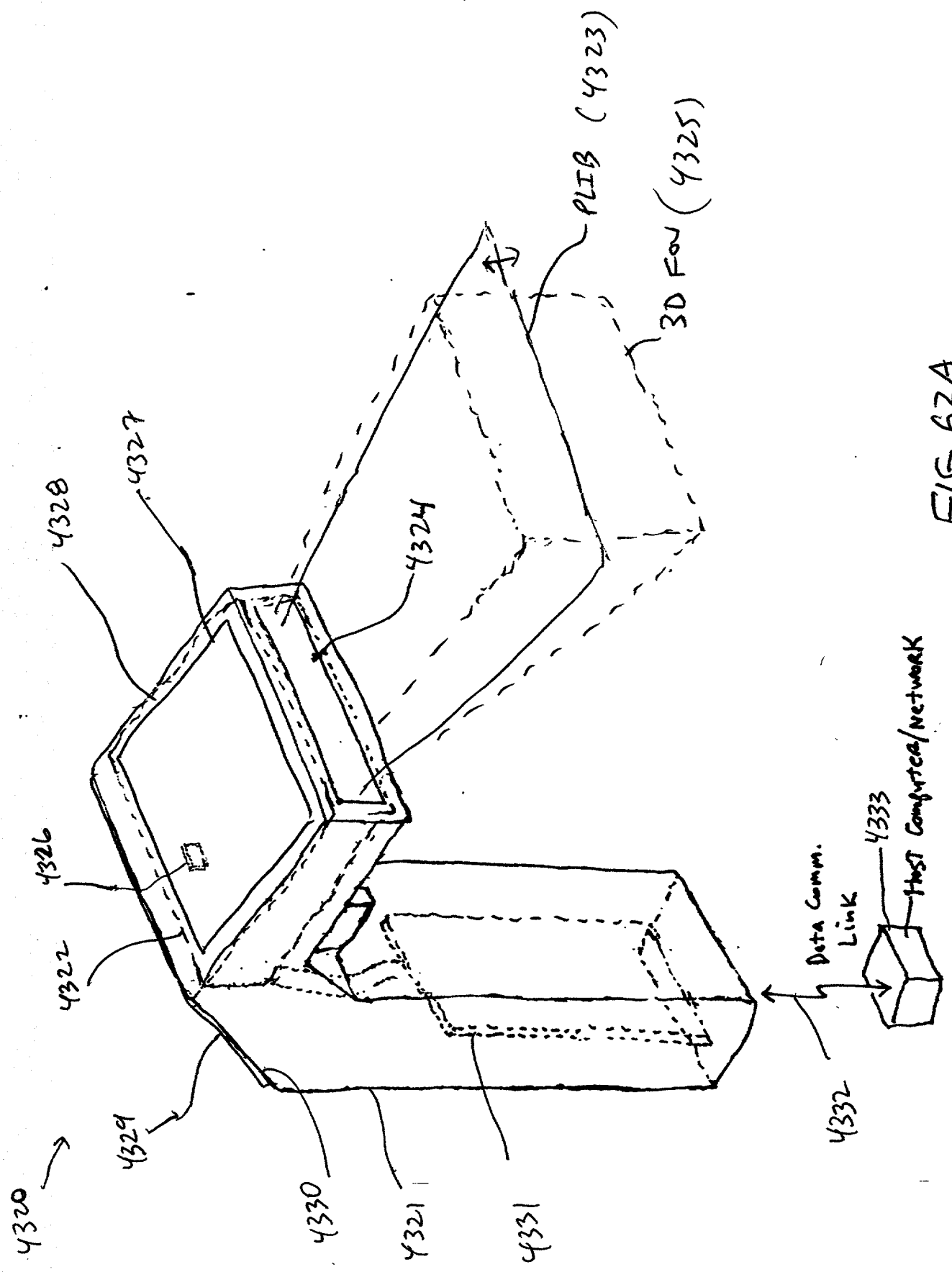


FIG. 62A



326/332

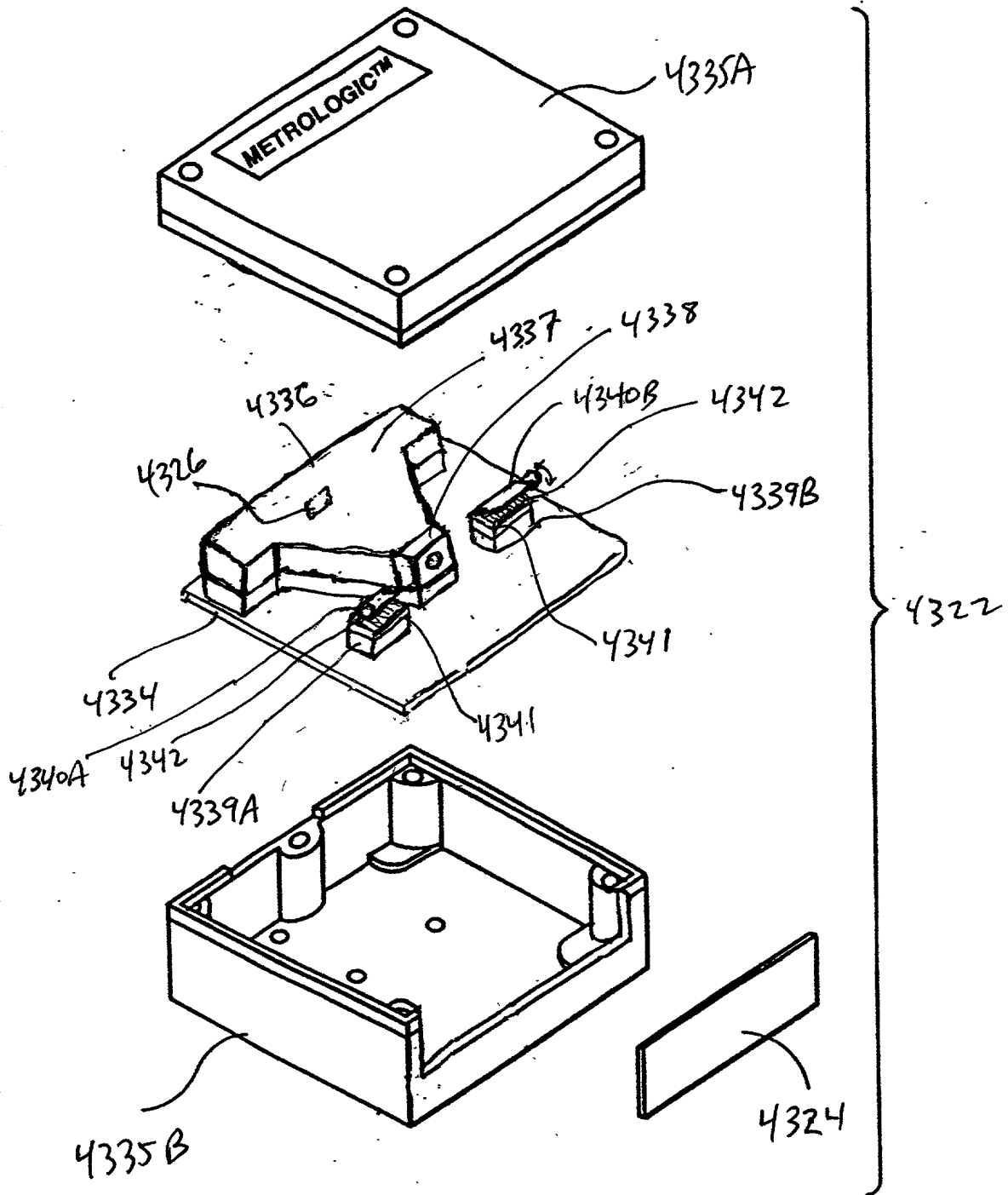


FIG. 62B

measuring  
spot intensity  
mod. panel

Fig. 1F21A-21D



FIG. 63A

328/332

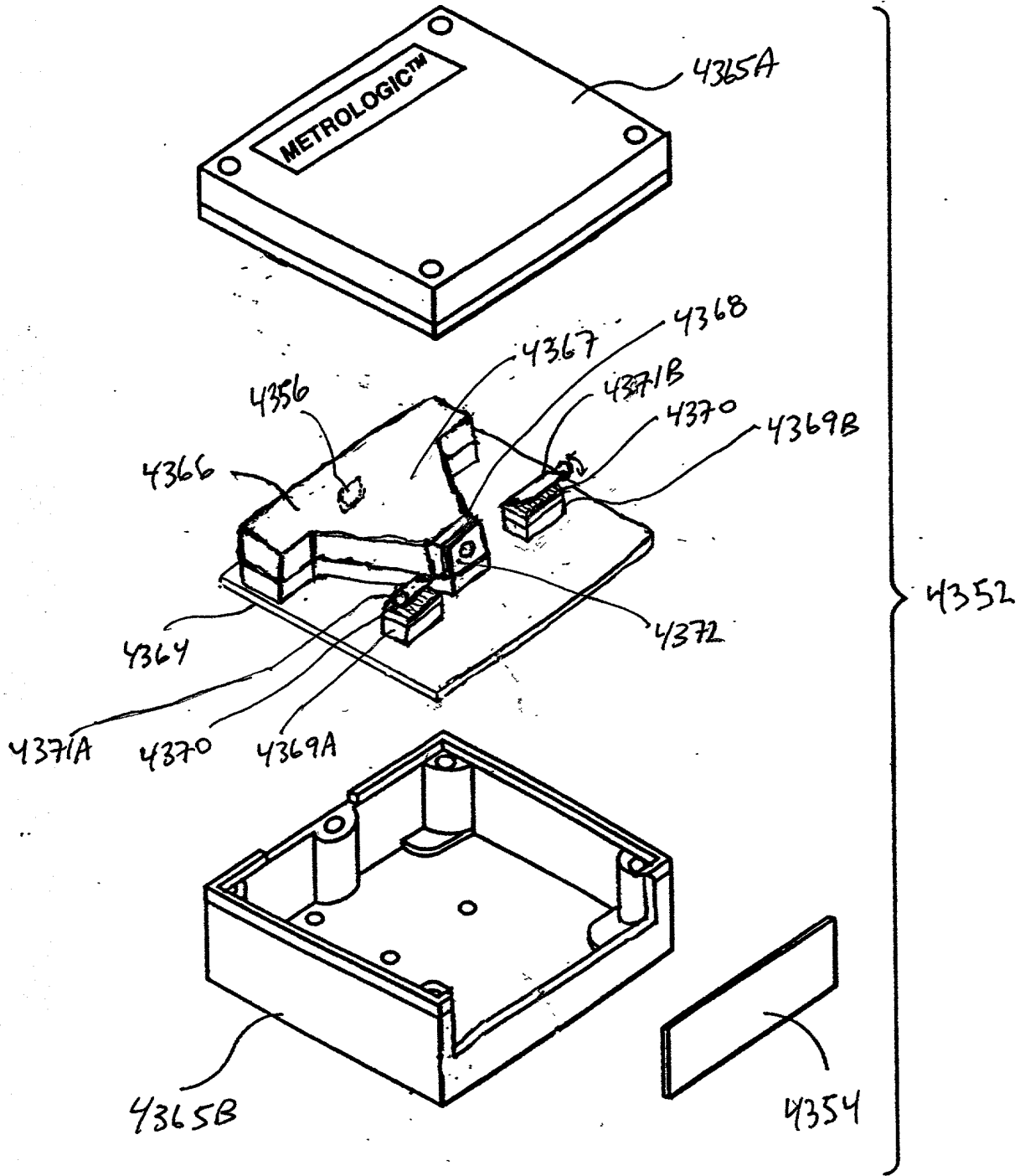


FIG. 63B

ED of.  
mechanical rotating iris

Fig. 1<sup>F</sup>  
23A - 23B

2099020-00889001



330/332

10068803-020602

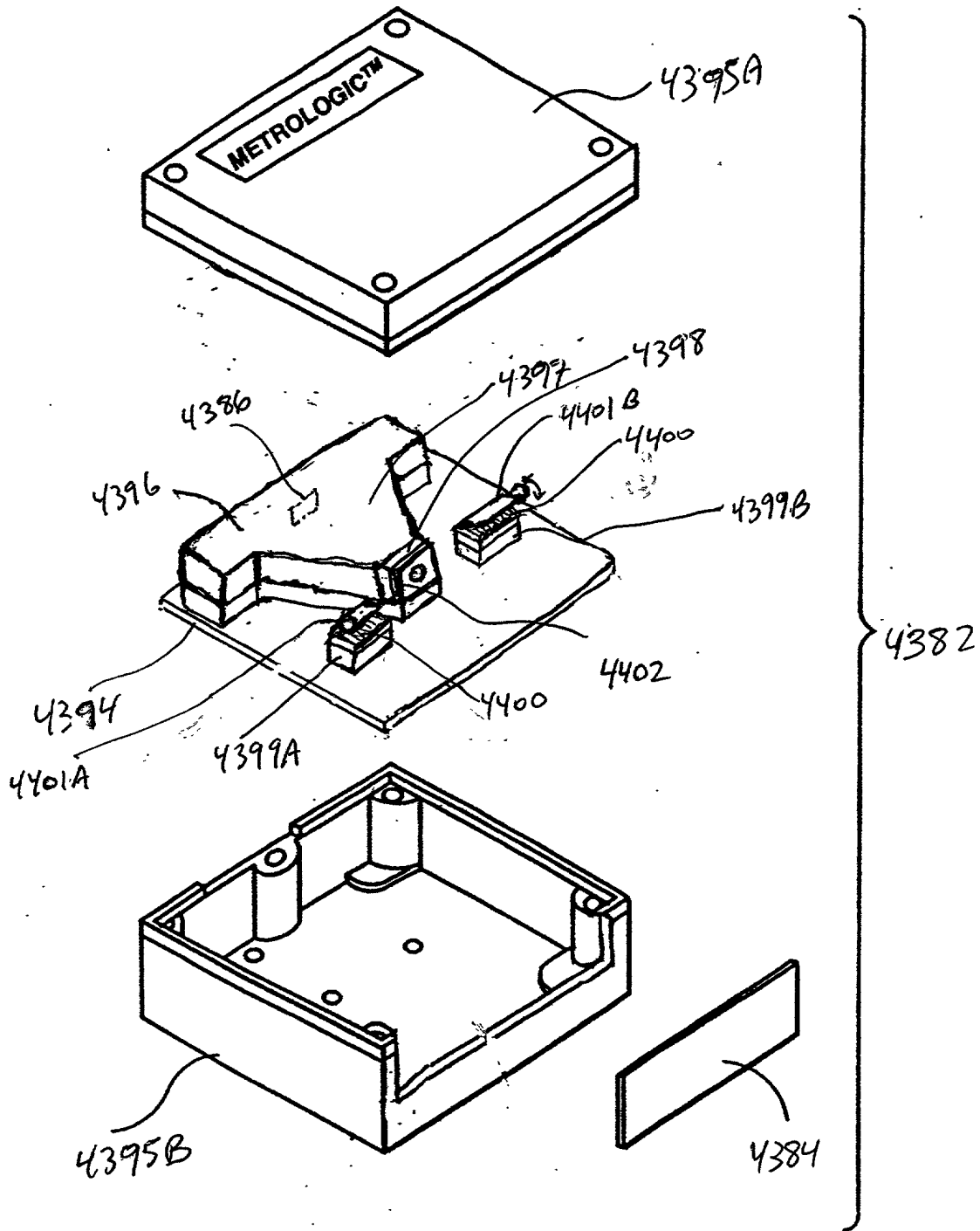


FIG. 64B

\* E-optical  
Shutter Before  
FP Lens  
Fig. 1E24A

331/332

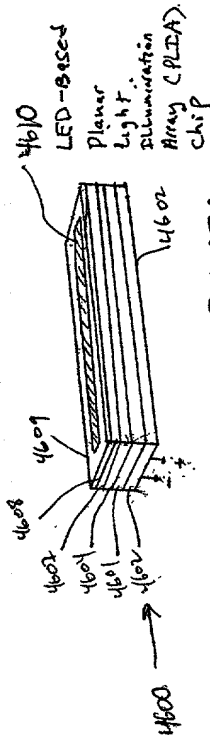


FIG. 67A

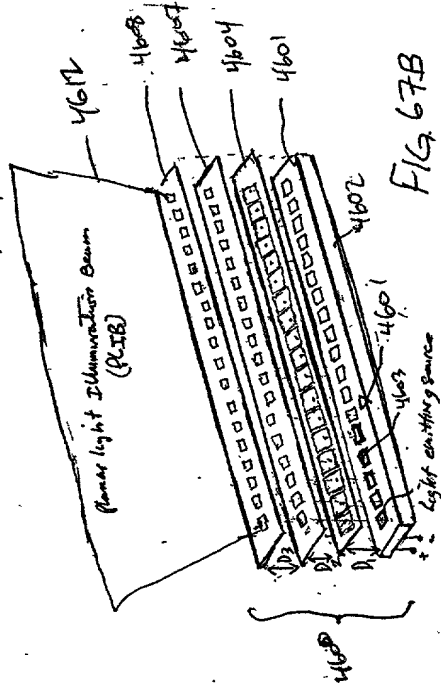


FIG. 67B

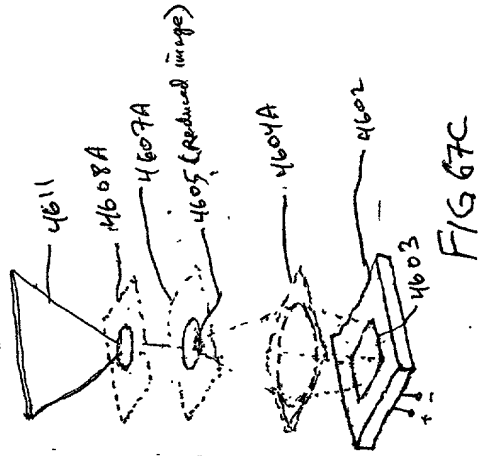


FIG. 67C

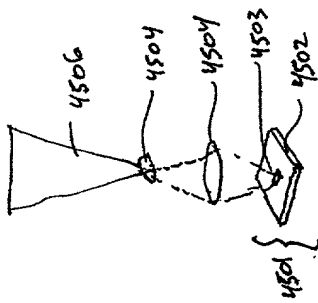


FIG. 65B

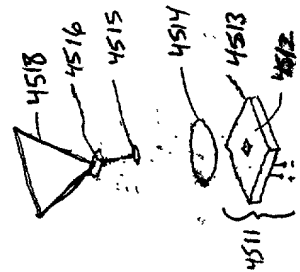


FIG. 66B

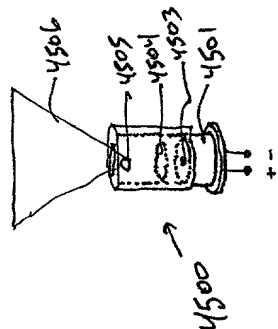


FIG. 65A

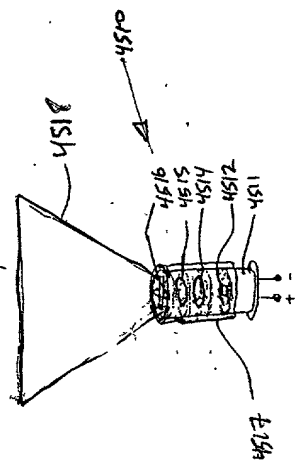


FIG. 66A

# Baggage check-in Station #1

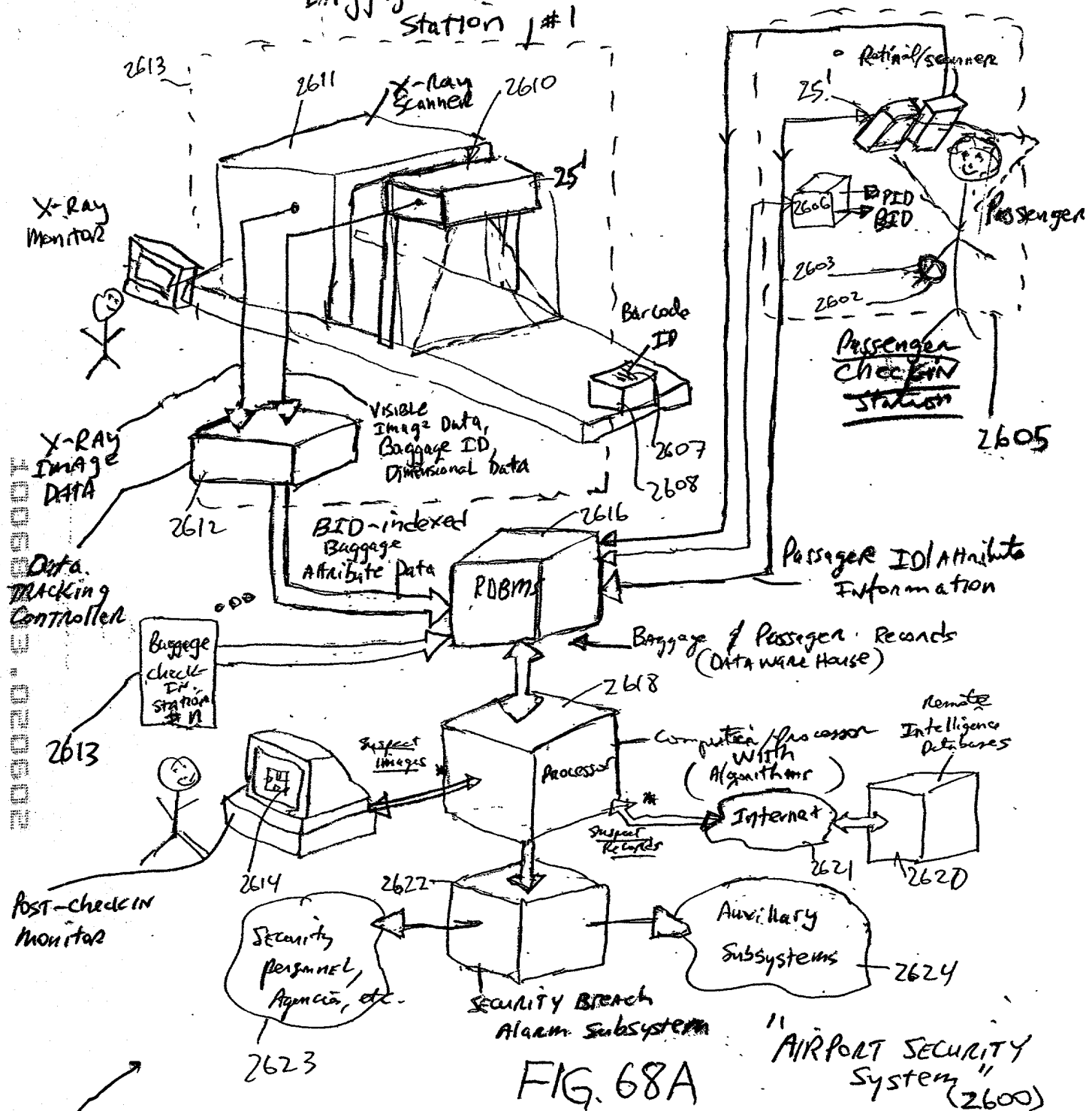


FIG. 68A

RDBMS Record X

Attribute data		2621
Passenger ID #	000	2620
Baggage ID #	000	2622
Baggage ID #	000	2622

FIG. 68B